UNIVERSITY OF CENTRAL ASIA

SCHOOL OF ARTS AND SCIENCES

Diploma Brochure: Class of 2025

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MESSAGE FROM THE RECTOR OF THE UNIVERSITY OF CENTRAL ASIA

On behalf of the management, faculty, and staff of the University of Central Asia, I extend my warmest congratulations to each of you on the successful completion of your senior projects. Your achievements are a powerful reflection of the dedication, perseverance, and academic rigour you have demonstrated throughout your years at UCA. Well done!

The diversity and depth of this year's projects - ranging from the development of a web application for mental health services, to critical environmental evaluations to, community impact studies - are genuinely inspiring. Many of your works draw on exciting, cutting-edge methodologies, and collectively, they showcase the remarkable quality and relevance of research emerging from UCA.

Your accomplishments not only highlight your individual growth and the guidance of our faculty but also reinforce your shared commitment to making a tangible difference in your communities, particularly in the mountain regions we serve. Witnessing your development and the quality of your final work has been a privilege for all concerned, especially your faculty mentors and tutors.

Your projects embody the mission of UCA: to advance knowledge and to nurture leaders devoted to improving the quality of life in Central Asia through evidence-based solutions. As you now step forward into new opportunities, I am confident that the skills, insights, and resilience you have gained will serve you well.

Hold fast to your commitment to excellence. Seek always to make meaningful contributions. And above all, continue to dream big - about the difference you can make in the world. On behalf of the entire UCA community, I wish you health, happiness, and every success in the exciting journey ahead.

Prof Christopher J Gerry
Rector
University of Central Asia

MESSAGE FROM THE DEAN OF THE SCHOOL OF ARTS AND SCIENCES

It is a distinct pleasure and joy for me to present the capstone projects' abstracts of the fourth graduating cohort of the UCA School of Arts and Sciences. Theses and capstone projects are important showcases for the work the graduates with the support and guidance of the faculty members were doing during all five years of their study at the UCA. They are meant to demonstrate the skills the graduates obtained at the University and the outcomes of the five years-long learning process.

However, it is only one of the first milestones in the lives of the SAS alumni. The theses and capstone projects can be developed further into full-scale academic or commercial products; they can also be dropped as the first experiments by the graduates who would choose to do something else in their future lives. The obtained skills, however, will be with them for very long time, whatever they choose to do next, whatever journey they would prefer to embark after the graduation.

For the readers of this brochure, I would like to express how proud we are to have graduates of the demonstrated caliber. For the alumni themselves, I would like to wish every possible luck and success in what they will do with their knowledge and their skills in the future.

Which, I am confident, is going to be bright…

Prof Maxim Khomyakov
Dean of the School of Arts and Sciences
University of Central Asia

Communications & Media

FROM SILENCE TO SCREENS: THE ROLE OF SOCIAL MEDIA IN RAISING AWARENESS ABOUT DOMESTIC VIOLENCE IN TAJIKISTAN

SULHIYA ABDURASHIDOVA

In Tajikistan, an estimated 80% of women experience domestic violence at some points in their lives, yet only 10% seek psychological or legal support due to cultural norms that discourage speaking out (Nurmagambetova, 2024). This research examines how social media, particularly Instagram, creates a space for victims, influencers, and the public to share experiences and raise awareness around domestic violence. Using Pierre Bourdieu's concept of Habitus, the study explores how domestic violence is portrayed and received within the context of Tajik cultural values. The research draws on three qualitative methods: content analysis of Instagram posts to identify key visual and textual themes; bottom-up thematic analysis of comments to understand audience perception; and semi-structured interviews with two female influencers to understand the personal stories behind their posts, what motivates them to speak out, and what challenges they face when dealing with online hate or cultural pressure to stay silent. By examining these elements, this research highlights how social media raises awareness, empowers women, challenges social norms, and encourages cultural change in conservative societies like Tajikistan.

Keywords: *Domestic violence, Tajikistan, social media, gender roles, cultural change, awareness.*

RESILIENCE IN ACTION. THE PORTRAITS OF FEMALE ENTREPRENEURS IN TAJIKISTAN

FARZONA AKHMEDOVA

This study presents a portrait of how young women entrepreneurs in Tajikistan develop resilience in response to gendered, cultural, and economic challenges. It does so in two ways: first, through the analysis of in-depth interviews with 11 women, and second, through photographic portraits of the participants—though these are portraits with a twist, as the women themselves are absent from the images.

The study adopts an intersectional lens to examine how factors such as age, marital status, and educational background influence the strategies these women employ. In addition to interviews, the research incorporates a creative visual component: a series of anonymized photographic portraits co-created with participants. These images serve both as data and as representation, capturing emotional layers and ethical considerations related to visibility, identity, and storytelling.

This capstone aims to contribute to the underexplored literature on gender and entrepreneurship in Tajikistan and to inspire new narratives around resilience, representation, and empowerment.

The findings show that most women entrepreneurs in Tajikistan are motivated by financial necessity, limited autonomy in traditional workplaces, and a desire to balance income generation with family care. Participants face a range of challenges, including gender stereotypes, family opposition, age discrimination, emotional strain, and lack of institutional support. Despite these barriers, the women demonstrate strong resilience by adapting business models, leveraging social media to gain legitimacy, building informal support networks, and aligning their businesses with family responsibilities. Intersectional factors such as age, marital status, education, and regional background significantly shape both their experiences and the strategies they adopt. These insights contribute to a deeper understanding of how women navigate entrepreneurship within Tajikistan's unique cultural and social landscape.

Keywords: *women entrepreneurs, resilience, Tajikistan, creativity, visual research, gender inequality, intersectionality.*

FEMALE LEADERS IN TAJIKISTAN'S TECH INDUSTRY: CHALLENGES, ACHIEVEMENTS, AND IMPACTS

MAYGUNA ALIBEKOVA

This research investigates the experiences of female leaders in Tajikistan's technology sector, where both leadership and tech remain male-dominated domains, particularly within the country's broader patriarchal context. Despite many challenges, a growing number of women are breaking gender norms and helping shape a more pluralistic professional environment in the country. This diploma project is an exegesis that combines academic research and creative storytelling to better showcase the difficulties, strategies, and social influence of female leaders in tech. The academic component is based on a thematic analysis of semi-structured interviews with four women leaders in Tajikistan's tech sector, focusing on the general themes of challenges, strategies, and impact. The analysis aims to reveal persistent patterns such as gender bias, cultural expectations, and leadership approaches within a male-dominated industry and society. The creative outcome is a non-fiction book titled "The Sources of Light", which shares each woman's story in a conversational style, combination of direct quotes from the interviews with the author's reflections. This method preserves the authenticity of their voices while making their stories accessible and emotionally engaging. By combining the research and experiential narrative, the project offers an intimate view on gender, leadership, and technology from a first – person perspective. At the same time, it is hoped that the project serves as an inspiring material for young female leaders, showing the power of personal storytelling in promoting gender equality.

Keywords: *female leadership, technology sector, patriarchal society, creative storytelling*

MAZAR WORSHIP IN WAKHAN, TAJIKISTAN: PRACTICES, BELIEFS, AND CHANGES

MUNISA BAIRAMBEKOVA

This research explores the role of Mazar (shrine) worship in shaping and reflecting the religious, cultural, and social identities of the Wakhi community in Namadgut village, located in the Wakhan Valley of Tajikistan. Drawing on qualitative fieldwork conducted over 24 days, the study investigates how shrine visitation, particularly at the Qadamgoh-i Shoh-i Mardon, functions not only as a spiritual practice but also as a lived expression of cultural memory and communal belonging. The research employs phenomenological theory and an autoethnographic approach, combining semi-structured interviews, participant observation, and personal reflection. As a member of the Wakhi community, the researcher positions herself within the narrative, offering insights into how sacred spaces are understood individually and collectively. The findings show that while core Mazar practices persist, they are also being reinterpreted in response to broader social changes such as migration, generational shifts, and modernization. Ultimately, the research reveals that sacred spaces like Mazars are not static symbols of the past, but evolving sites where multiple identities are preserved, negotiated, and transformed.

Keywords: *Mazar worship, multiple identities, Wakhi community.*

BRAND, TRUST, AND COMMUNITY: LOCAL RESIDENTS' PERCEPTIONS OF THE UNIVERSITY OF CENTRAL ASIA, NARYN

KAIRAT BERDISHALIEV

This study explores how local community stakeholders in Naryn, Kyrgyzstan perceive the University of Central Asia (UCA), focusing on institutional presence, impact, and communication dynamics between the University and local residents. Established in the 2000s through a memorandum between the Presidents of Kazakhstan, Kyrgyzstan, Tajikistan, and His Late Highness the Aga Khan, UCA represents a unique case of a multi-national university operating simultaneously across three Central Asian countries with a mission to contribute to the socio-economic development of mountainous regions.

Through semi-structured interviews with local residents, analysis of local newspaper archives, and examination of UCA's publicly available materials at the School of Professional and Continuing Education in Naryn town (a primary information source for locals), this research identifies potential communication mismatches between institutional self-representation and local perceptions. The study employs Norman Fairclough's institutional discourse analysis framework and transitivity analysis to examine discourse construction. Particular attention is given to UCA's dual role as both an academic institution and a development agency, investigating how this duality shapes community understanding and engagement.

This diploma project aims to identify barriers to building positive brand reputation and local loyalty (defined as active community engagement with the university's development initiatives). Rather than providing immediate solutions, the research offers a thematic analysis of current perception gaps that may inform UCA's administration and potentially benefit other international organizations operating in Central Asian contexts where similar reputation management challenges exist.

Keywords: *discourse analysis, brand reputation, loyalty, the University of Central Asia, community perception, branding strategies.*

CULTURAL NORMS AND GENDER DYNAMICS IN TAJIKISTAN: EXAMINING ONLINE HARASSMENT OF YOUNG WOMEN

FARANGIS BOBJONOVA

This study explores the cultural and societal factors that contribute to online harassment and the prevalent forms of online harassment in Tajikistan. Online harassment refers to various behaviors perpetrated through technological platforms, including derogatory messages, threats, and doxing. It disproportionately targets young women, contributing to gender inequality in digital spaces. Women face challenges when entering the digital realm, as societal norms and cultural expectations dictate the prevalence and nature of online abuse in Tajikistan. The research employs a mixed methods approach that combines content analysis of 30 Instagram video reels with an analysis of over 3500 comments related to online bullying, along with thematic analysis of interviews with three women who were victims of online harassment. Intersectionality theory is applied to understand how multiple social identities, such as gender, religion, or cultural background, converge to impact experiences of online harassment. The study found that appearance-based harassment is the most common type, comprising 19.38 percent of comments, followed by religious and gender-based harassment. Religious backlash often occurred as a result of content featuring revealing clothing, self-expression, and public visibility that provoked harassment, while harassment based on gender arose when women exhibited independence or did not adhere to traditional gender roles. The study makes a significant finding that cultural values and gendered power structures are determinants in harassment patterns and explains that women who challenge societal norms regarding modesty and behavior are subjected to disproportionate harassment. It further contributes to the literature by offering insights into the specific cultural dynamics of online harassment in Tajikistan and how gender, religion, and social expectations impact women's digital experiences and online harassment.

Keywords: *online harassment, trolling, derogatory messages, cultural norms, digital violence, Tajikistan*

THE PRICE OF GOLD: THE KUMTOR CYANIDE SPILL, MEDIA NARRATIVES AND FOREIGN CAPITAL

FINNLEY MACDONALD

This research investigates the differences between media portrayals of the 1998 cyanide spill near the Kumtor Gold Mine in Kyrgyzstan and the lived experiences of local communities and workers. Drawing on framing theory (Goffman, 1975; Entman, 1993), this study examines the building of opposing disaster frames and their connection to power struggles during post-Soviet Kyrgyzstan's transitional period. The study integrates content analysis of 11 articles spanning 1998-2021 with interviews with former employees of Kumtor and Barskoon and Issyk-Kul residents to highlight how media consistently focused on corporate responsibility and cyanide dangers while downplaying chlorine usage and government participation. Findings show that the media frames showed sympathetic views to villagers yet maintained a simplified "villain vs. victim" dynamic which overshadowed scientific nuance and structural accountability. This study contributes to wider communication discourse by revealing how transitional democracies contend with media narratives post-disaster, and the lasting effects of selective media framing on public perception, scientific discourse, and justice for marginalized communities.

Along with the written analysis, the findings chapter is also delivered in podcast form to communicate key themes to an English-speaking non-academic audience. The podcast, through narrative storytelling, connects academic research and public discourse, emphasizing accessibility and emotional impact.

Keywords: *Kumtor Gold Mine, Kyrgyzstan, cyanide spill, media framing, disaster communication, post-Soviet journalism*

INDEPENDENT JOURNALISM IN TAJIKISTAN

SHUKRONA MAMADAYOZOVA

This study investigates how exiled independent journalists from Tajikistan maintain accuracy in their reporting while working under the difficult and dangerous conditions. Independent journalism is a journalism practice which is not influenced by corruption, government or influential people. Independent journalists of Tajikistan are one of the sources that provide relatively objective and reliable information on issues such as corruption, social violence, and regional events. They are subjected to violence including physical abuse, harassment (online and offline) and imprisonment. Due to the government's crackdown on the media, journalists are compelled to flee the country for their own safety. They work online, using Instagram, Facebook, and Telegram to disseminate information that can be useful to society and to keep the public informed. Recently, their efforts have brought important discussions to previously overlooked topics, including conflicts between the Tajik government and Pamiri minorities. This research is based on the theory of transnationalism that explains how exiled journalists maintain the connection with their homeland and keep doing professional work across borders. Using a qualitative approach, the research is based on in-depth interviews with four journalists currently living in different parts of Europe. The study explores the challenges they face, including limited access to sources, censorship, and personal safety concerns. It also looks at their strategies for ensuring accuracy and credibility in their work. The findings show how independent journalists continue to inform the public and preserve freedom of expression, despite facing significant risks and limitations. This research shows exile transforms journalism into a transnational professional practice, one that is restructured around new spaces, technologies, values, and relationships.

Keywords: *exiled journalists, Tajikistan, accurate reporting, media repression, transnational journalism*

THE ROLE OF DIGITAL MEDIA IN PROMOTING EMERGING FOOTBALL TALENTS: A CASE STUDY TAJIKISTAN'S MEDIA LEAGUE

MUSTAFO MUMINSHOEV

This study investigates the Media League, a community-focused football initiative in Tajikistan, and its use of digital media platforms, particularly Instagram and YouTube, to enhance opportunities for young and emerging football talents. Unlike traditional professional leagues, the Media League operates as a social community where digital media is crucial in influencing public perception, increasing player visibility, and promoting recognition. The study employs a mixed-methods approach, integrating social media audience analysis with comprehensive semi-structured interviews with valuable individuals, such as the league's organizers, managers, coaches, professional footballers, and influencers. Through the cross-mapping of stakeholder perspectives and engagement metrics, this study provides significant insights into the role of digital media in shaping alternative football ecosystems. The findings indicate the importance of digital platforms in promoting community engagement, increasing visibility for talent, and establishing fresh possibilities for amateur athletes to reach professional opportunities.

Keywords: *Media League, digital media, football talent, content strategy, grassroots sports, social media visibility, influencer impact.*

STRINGS OF BELONGING

UMED QURBONBEKOV

"Strings of Belonging" is a short documentary film that captures the fascinating cultural history, and the spirituality related to the Pamiri rubab, a strummed instrument from Tajikistan's mountainous Pamir region. The film depicts Jonboz's, the noted musician and cultural expert from the Pamir region, comments on traditional music and its significance in the preservation and transmission of culture, memory, and intergenerational continuity. Personal story as the 'first musician' of a family of craftsmen, highlighting how music can create an identity and contribute to culture preservation. Besides being a string instrument, the rubab is also an astonishing example of the craftsmanship of barrel-making from apricot wood. It is carved by expert hands, nurtured by unwavering culture, and grounded in rich historical consciousness. Its construction and sound carry references of deep faith and philosophy making it an instrument of profound music and spirituality.

The film portrays people such as Sheruya, who furthers the evolution of the rubab by ingeniously designing a ten-string version of it, thus integrating modern and traditional cultures.

This shift represents a constructive blending of innovation as well as tradition, allowing the instrument to be used in modern settings. Furthermore, the film looks at the lack of female rubab players in the Pamir region, revealing the sociocultural aspects that have stifled women's engagement in this form of art. "Strings of Belonging" shows how traditional music helps people stay connected to their cultural roots, while also adapting to new musical forms through innovations like the modernized rubab.

Keywords: *Pamiri rubab, cultural identity and heritage, symbolism, devotional music, ethnography*

PAMIRI MIGRANTS IN RUSSIA: LIFE AFTER THE CROCUS CITY HALL INCIDENT

MANIZHA TURDIEVA

This study examines the impact of the Crocus City Hall attack on the lives of Pamiri migrants in Russia. On March 22, 2024, a terrorist attack in Moscow resulted in 144 deaths and injured 555 people. This incident affected Central Asian migrants, particularly those from Tajikistan, as four Tajik nationals were identified as culprits responsible for this attack. The attack led to heightened discrimination, job losses, and a decrease in social acceptance of Central Asian migrants in Moscow. Pamiri migrants, holding Tajik passports, found it increasingly difficult to secure employment and conduct their daily lives in Russia.

Based on in-depth interviews with fifteen Pamiri migrants in Moscow, aged 23 to 40, the most active working group, the research explores how the Crocus City Hall incident has affected their job prospects, workplace experiences, and social integration. By highlighting the challenges faced by this community, the study aims to offer insights into the broader issues of migration and discrimination in Russia.

The rationale for this study is to raise awareness about the discrimination Pamiri migrants face in Russia, helping potential migrants better prepare for social and legal challenges. Beyond its practical relevance, this research contributes to academic discussions on migration by showing how political issues can worsen existing prejudices.

Keywords: *Pamiri migrants in Russia, Crocus City Hall incident, legal challenges, social interactions, discrimination*

NAVIGATING ARTISTIC FREEDOM: THE ROLE OF TOKMO AKYNS IN CONTEMPORARY KYRGYZSTAN

ERBOL SOVETALY UULU

The research evaluates the artistic freedom practices of Kyrgyzstan's improvisational poets who perform under varying degrees of state censorship. Tokmo akyns function as cultural figures who protect traditional oral traditions but also use their position to express thoughts about social and political problems. Research about media censorship in Kyrgyzstan has gained substantial attention but actual studies on how traditional artists deal with official expression boundaries remain scarce. The research utilizes qualitative methods through interviews with well-known Tokmo akyns and a cultural expert along with document reviews. The research utilizes thematic analysis together with symbolic capital theory from Bourdieu and hidden transcripts theory from Scott and dramaturgical concepts from Goffman to understand the data. New research demonstrates how Tokmo akyns implement multiple ways to navigate their opposition to social norms through techniques which range from challenging expressions to classifying criticism through artistic devices. The performers implement these tactics because of their historical background and social role requirements along with their positions in the cultural sector. The study helps clarify traditional performers' approaches when dealing with political pressure by either resisting directly or adjusting through flexibility. This research provides valuable directions to cultural policymakers and artistic communities along with scholars of censorship who can understand how performance continues to thrive while oral traditions remain resistant in Kyrgyzstan's transforming political environment.

Keywords: *Censorship, Tokmo Akyn, Oral Folklore, Cultural Transmission*

BROKEN ILLUSIONS: NAVIGATING DIVORCE FOLLOWING EARLY MARRIAGE IN CONTEMPORARY TAJIKISTAN

NAFISA KHUDONAZAROVA

According to CABAR.asia, in Tajikistan around 4,000 girls under the age of eighteen get married every year, often before they have a chance to complete their high school education. Most of these marriages are arranged, driven by deep-rooted cultural tradition and socio-economic pressure. This leaves many young women with limited freedom to pursue further education, build careers, and make informed decisions about their future. Most enter marriage without fully understanding themselves, often internalizing their circumstances due to societal expectations and a lack of support. Some women view this as a cultural norm, while others feel trapped in marriages they did not truly consent to. A small but significant number of these women find the courage to get divorced, viewing it as an escape from an oppressive situation. This research examines what divorce means for these young women. Does divorce empower women by providing freedom for self-expression, personal growth, and life reconstruction, or does it lead to further socio-economic hardship within Tajikistan's cultural and socio-economic context? Through the lenses of empowerment theory, the concept of agency, and gender theory, this research examines the lived experiences of women who have undergone early marriage and subsequent divorce in contemporary Tajikistan. The stories of ten divorced women were collected through semi-structured interviews and are at the center of this study. To reach a wider audience and have an impact, the findings are disseminated through a multimedia webpage.

Keywords: *agency, cultural traditions, early marriage, divorce, post-divorce, gender roles, gender theory, women empowerment.*

THE ROLE OF SOCIAL MEDIA IN MAKING PRODUCTS TREND: CASE STUDIES OF KYRGYZ ENTERPRISES

AIDA ASANOVA

Social media has become a powerful tool in Kyrgyzstan to determine product popularity and consumer behavior with the rise of Instagram and TikTok.This study analyzes the digital marketing strategy of three Kyrgyz enterprises: Macaronnaya Lavka (and its founder Sabina Temiralieva), Olpok Store, and MBank, to understand how they use social media to make products trend. The research is based on Emotional Branding Theory, Diffusion of Innovations, Cultural Branding and Glocalization, Self-Branding & Influencer Credibility Theory, and adopts a mixed methods approach. 396 Instagram and TikTok posts were collected, and 140 posts, which were the most and least liked, were analysed in depth. Also, semi-structured interviews were conducted with marketing professionals to gain insight into the ways strategic choices have been made and whether there has been a cultural adaptation involved. Emotional storytelling, trend-based content, personal branding, and platform engagement are found to be what drive product visibility and business growth. The study contributes to the understanding of social media marketing in emerging economies and provides actionable insights for Kyrgyz entrepreneurs. It contributes to the understanding of social media marketing in emerging economies and provides actionable insights for Kyrgyz entrepreneurs.

Keywords: *Social media engagement, Kyrgyz enterprises, cultural branding, social media strategies, Instagram, TikTok*

THE FUTURE THAT NEVER HAPPENED: INTERGENERATIONAL MEMORY AND LONGING FOR THE SOVIET PROMISES IN BALKHASH.

ANASTASIA KHAVANSKAYA

This exegesis contributes to post-Soviet memory studies by focusing on youth in Central Asia, particularly in remote industrial towns like Balkhash, Kazakhstan, where the Soviet legacy is deeply embedded in urban infrastructure, industry, and social life. The research investigates how young people who never lived in the USSR develop emotional connections to its utopian ideals through inherited memory and cultural residue. The artistic outcome, a zine, visually and narratively captures multigenerational oral histories, revealing how nostalgia for a non-existent future is felt in everyday life, aesthetics, and cultural memory.

The project explores the nostalgia for the future, the longing for utopian dreams that never materialized, in the particular post-Soviet context of Balkhash, where the Soviet "spirit" still lingers. Based on in-depth interviews with participants aged 18 to 75, it analyzes how intergenerational memory, transmitted through family stories, cultural remnants, and the urban landscape, intersects with contemporary socio-economic uncertainty to generate longing for a future that was once hoped for but never achieved. The central paradox is the emotional resonance modern youth feel toward Soviet ideals they never directly experienced. These ideals permeate generational consciousness through family narratives, Soviet architecture (such as the Palace of Metallurgists and "stalinki"), media artefacts like cartoons and films, and inherited customs.

The discussion relies on Svetlana Boym's reflective nostalgia which allows people to acknowledge loss while accepting progress and Mark Fisher's hauntology which examines how late capitalism has created cultural stagnation and eliminated alternative futures and the metamodernist sensibility described by Vermeulen and Van den Akker which shows an emotional swing between irony and sincerity that mirrors the post-Soviet condition.

Keywords: *reflexive nostalgia, hauntology, youth, Balkhash, intergenerational memory, Soviet*

THE PROCESS OF ADVANCING A NON-FICTION FILM DURING THE LATER STAGES OF PRODUCTION

MEHRANGEZ SAIDMAMADOVA

Using the example of the documentary Alone in a Dance for Two, this study focuses on the process of advancing a non-fiction film in the later stages of production particularly the issues of shaping narrative and artistic vision under limited resources. The main focus is the transition from chaotic shots after filming to the conscious structuring of the material during editing, when the story emerges not from a set script, but through analyzing the internal rhythm and emotional arc of the characters. The study is based on practical experience, supplemented by theoretical works on documentary storytelling (S. Bernard), observational cinema (D. McDougall), and intuitive editing (N. P. Andersen). An important aspect of the research was ethical reflection: where is the line between directing and manipulation? How to preserve the truth of life while working with composition and accents? These questions led me to the conclusion that honesty in documentary is not about passive fixation, but a conscious choice that respects reality but is not afraid to interpret it. The practical value of the work lies in its honesty about the difficulties faced by an aspiring filmmaker, from organizing material to sound design to finding a visual language. I share not only successful solutions but also mistakes that have become part of my method. This study is not an instruction manual, but a personal experience that can help similar young filmmakers shorten the path to their first movie, reduce anxiety, and find a balance between intuition and structure.

Keywords: *non-fiction film, documentary, post-production, editing, narrative, ethics, observational method, low-budget cinema*

Computer Science

ML-DRIVEN FLOOD PREDICTION AND EARLY WARNING SYSTEM

AELINA DANIIAR KYZY

This research presents a machine learning-driven flood prediction and early warning system designed for Kyrgyzstan's mountainous regions. The system employs real-time observations of hydrometeorology, satellite-retrieved quantities, and terrain to generate up to 48-hour lead times probabilistic forecasts of floods. The approach hybridizes traditional machine learning models and fuzzy logic with a hybrid-stack framework, being sensitive to the idiosyncrasies in forecasting mountain catchments with sparsely observing networks. The algorithm achieves an ROC AUC score of 0.958 and demonstrates significant improvement on baselines, especially for extreme event detection. At the same time, the deployment has a modular design with automatic data importing, feature engineering, calibrated predictions, and an exposed REST API for integration into warning systems. In addition, containerized deployment ensures scalability and reliability with low maintenance overhead. The solution that this research gives addresses an essential gap in Kyrgyzstan's disaster management system and establishes a framework that may be used in similar regions where early flood warnings are essential for protecting vulnerable communities.

Keywords: *flood prediction, early warning, Machine Learning, Python, Dashboard, Fuzzy Logic*

DEVELOPMENT OF A WEB APPLICATION FOR MENTAL HEALTH SERVICES AT UNIVERSITY OF CENTRAL ASIA

AISHA TOICHIEVA

University students face challenges in accessing mental health services because traditional paper-based appointment systems create unnecessary obstacles for them. The University of Central Asia's observed challenges led me to create an online platform which modernizes student access to mental health resources. The project solves UCA's current system bottlenecks through its implementation of a complete online solution that replaces physical sign-up sheets. Through Django and PostgreSQL and Bootstrap I developed a website that functions on all devices while resolving multiple essential problems. Students can now schedule appointments without office visits while viewing counselor availability through an interactive calendar and access mental health resources and stay updated about campus wellness events. The system includes role-based permission controls to display content only to students and counselors and email verification protects access to users within the UCA community. The appointment system synchronization with counselor schedules proved difficult during development alongside the requirement for mobile responsiveness. The platform showcases effective technology implementation to eliminate mental health support barriers despite the inability to complete all intended features because of time limitations. The developed work provides essential knowledge to educational institutions that want to enhance their mental health service delivery through digital transformation.

Keywords: *fMental health services, appointment scheduling, Django, PostgreSQL, university student support, web development*

AGROCONNECT: AN ONLINE AGRICULTURAL MARKETPLACE CONNECTING FARMERS AND BUYERS IN KYRGYZSTAN

AIZADA BERDIBEKOVA

Agriculture is one of the main sectors of the Kyrgyz economy, but farmers face severe challenges such as restricted market access, inefficient distribution channels, and heavy wastage. Traditional sale points, such as bazaars, will restrict the potential of farmers, and price fluctuation and unnecessary losses are the outcomes. To find a solution to such problems, the project offers AgroConnect, an e-platform that connects farmers in the region with consumers and companies through data-driven technologies. AgroConnect development entails three principal phases: platform development, AI analytics, and market optimization. Django is used as the backend, React.js as the frontend, and PostgreSQL as the database manager for scalability and ease of use. AI analytics entails the use of machine learning models for demand forecasting, dynamic pricing, and decision-making recommendations to enable farmers to maximize their sales strategy. The results confirm that AgroConnect effectively encourages sustainability through combatting food waste and farmers' income increase via AI-powered knowledge and direct selling to consumers. With the promise of revolutionizing agriculture in Kyrgyzstan, the platform now can grow internationally. Further development includes the addition of a mobile application and the implementation of blockchain technology for secure and trackable transactions.

Keywords: *Crop market, AI solutions, demand forecasting, dynamic pricing, sustainable agriculture, machine learning, Kyrgyzstan.*

A CULTURALLY SENSITIVE POSTPARTUM DEPRESSION DETECTION USING MACHINE LEARNING AND INTEGRATION OF LLM-BASED SUPPORT CHATBOT IN KYRGYZ LANGUAGE

AIZHAMAL ZHETIGENOVA

Postpartum depression (PPD) is a critical public health issue affecting 10–20% of new mothers worldwide, with rates even higher in low-resource settings. The combination of small mental health services alongside traditional cultural refusal to accept mental health oversight and spoken language challenges results in unidentified maternal depression cases in Kyrgyzstan. The research evaluates a culturally appropriate digital tool designed for PPD screening and support of Kyrgyz-speaking postpartum mothers. Supervised machine learning (ML) and large language models (LLMs) operate through a user-friendly multilingual web system. A survey for the data collection was conducted with 108 mothers in Naryn, Kyrgyzstan, who delivered customized demographic, emotional, and social assessment questions. The CTGAN tool generated synthetic data to deal with the imbalance in the PPD risk levels. The best performance was obtained through CatBoost with Leave-One-Out Cross-Validation (LOOCV) training, which produced an accuracy rate of 92.7%. Users can complete surveys on the web platform UmAI through its React and FastAPI structure and immediately obtain risk evaluation and psychoeducation content. LLaMA-based support chatbot KoldooAI gives empathetic help to users in the Kyrgyz language. Integrating ML with LLMs produces effective mental health support systems that are ethical and culturally suitable for underserved populations. The system demonstrates scalability potential as an early PPD screening program that can extend its operations throughout Central Asia and beyond.

Keywords: *postpartum depression, machine learning, CTGAN, CatBoost, large language models, cultural sensitivity, maternal mental health*

RAINING AI-DRIVEN ENEMY NON-PLAYABLE CHARACTERS IN A ROGUELIKE FANTASY SOULS-LIKE GAME USING UNREAL ENGINE 5

AKYL TASHTANALIEV

The project aims to introduce RL algorithms to utilize intelligent NPCs with varying behavior and dynamins in a first-person shooter game created by Unreal Engine 5. The main goal here is to inspire the feeling of the game world's real presence by creating NPCs with the capability of self-education, self-development, and self-determination. Hence, NPCs will adopt a variety of abilities such as covering during a fight, optimally moving by the things they observe, and instantly responding to perceived dangers during the road quest by way of RL training. This will prove critical towards players' continuous challenges, considering that enemies adapt their behavior during fights to suit the player's actions and style. The project adds to the improvement of the gaming experience as the Minecraft system incorporates or takes advantage of machine learning algorithms in the Unreal Environment.

The project evaluates the use of Reinforcement Learning (RL) to add robust and autonomous behavior to the group of non-player characters (NPC) within a roguelike game designed using Unreal Engine 5. The aim should be first to heighten player immersion that can only be achieved by introducing fluid game dynamics and frequently changing enemy's patterns of coordination. We are involved in the development of a variety of improvements that can be made to the realm of the game using machine learning, which is one of the most powerful tools.

Keywords: *Reinforcement Learning, Unreal Engine, Learning Agent, ML agents, Game development, Multi-Agent, Machine Learning*

MACHINE LEARNING-DRIVEN OBJECT DETECTION AND FACE RECOGNITION SYSTEM FOR THE VISUALLY IMPAIRED

ATTIULLAH KHAN NIAZI

The project is about the creation and implementation of an assistant application for visually impaired individuals. The application incorporates machine learning techniques to identify individuals and objects in real time. This will greatly help people with blindness to be socially independent. The project uses You Look Only Once (YOLO) and Convolutional Neural Networks (CNN) to detect objects and faces in real time with high precision. The app has a voice-feedback system integrated within which will help the user interact with the surrounding environment. The text-to-speech feature will provide the user with a description of their surroundings. The scalable and user-friendly nature of the app makes it stand out in the pool of applications present today. The research methodology was a comprehensive one that analyzed the gap between two of the most used solutions "Be My eyes" and "Seeing AI." The application was then designed to bridge the gaps identified. The comparative analysis highlights the significant strides the project takes in filling those gaps. The project has a wide applicability in the assistance technology field. The use of Machine learning makes it possible to tackle real-life challenges faced by the blind members of the society. The goal of an inclusive society is ever closer by this application.

Keywords: *Assistive apps, Object Detection, Face Recognition, Text Recognition, Machine Learning, CNN, YOLO, OCR, Real-time application, Visually Impaired.*

DESIGN AND DEVELOPMENT OF FITNESS PROGRESS TRACKING APPLICATION

BAISTAN TASHKULOV

Mobile health apps are gaining more usage, which creates a real opportunity to help people achieve their fitness goals. This paper examines how to design and build a comprehensive fitness app. It focuses on the challenges faced by individuals who are new to gyms. Many people who initiate fitness programs lack the confidence or knowledge to create effective workout plans or monitor their progress on a regular basis. The app aims to address these issues. It offers workout plans designed for everyone. The plans are created manually or with the help of artificial intelligence. The app also includes robust tools to track progress, record workout sessions, monitor diet, share updates on social media, and allows experienced users to provide workout guidance. With a modern technology stack that includes React Native for cross-platform mobile development, Golang and PostgreSQL for building a scalable backend, and AWS for cloud infrastructure, the app is able to achieve this.

Keywords: *Mobile health application, Fitness, Track Progress, PostgreSQL, AWS*

IDOCTOR: HEALTH INFORMATION SYSTEM (HIS)

ELDAR ULANOV

Healthcare facilities need efficient data management in their evolving environment to deliver high-quality patient care and reduce administrative burdens, and optimize hospital workflows. Various medical institutions throughout developing regions use outdated digitized systems and paper-based recordkeeping which creates operational challenges along with safety risks for uncontrolled patient data. The project introduces iDoctor HIS, which serves as a complete Healthcare Information System to solve these Healthcare System shortcomings, utilizing a central digital system for patient records and scheduling services, and therapeutic sequence maintenance.

The system development adopts a systematic process that integrates secure data platforms with scheduling automation and electronic health record capabilities for process improvement. The system builds its architecture from contemporary software development frameworks for reliable integration with medical institutions and unlimited scale potential, and dependable operation. The system deployment consists of authentication security features, along with data encryption services and role-specific access controls, which fulfill regulatory requirements for medical data protection.

Medical staff will perform system assessments through performance tests that measure key indicators, including system efficiency and data precision, combined with user satisfaction, alongside appointment management enhancements. The outcomes from such analyses between classic healthcare management systems against digital transformation in medical institutions will demonstrate their clear benefits. The project targets healthcare service quality growth, together with reduced patient record errors and the development of an accessible interface for healthcare professionals and patients.

Medical record-keeping, along with hospital administration benefits, will be demonstrated to healthcare information system developers using the findings of this research. Upcoming updates will incorporate AI analytics together with telemedicine technology and database connection to public healthcare resources, which will enhance accessibility and operational efficiency.

Keywords: *Artificial Intelligence, Medical, IDoctor, Healthcare*

EVOLUTIONARY TIMETABLING FOR THE UNIVERSITY OF CENTRAL ASIA: A GENETIC ALGORITHM APPROACH WITH OPTIMIZED DATA STRUCTURES

ELNAZAR ULANBEK UULU

A genetic algorithm forms the basis of the automated system which this diploma project proposes to solve complex university course timetabling problems at the University of Central Asia (UCA). The research analyzes the implementation of Evolutionary Algorithms (EA) to generate timetables because traditional manual scheduling approaches require extensive time while causing multiple errors. Optimized data structures form a critical element of this project since they need to optimize genetic algorithm efficiency and performance when applied to UCA's academic environment. The document presents an explanation of research methods that focus on genetic algorithm design as well as selected data structures and evaluation procedures. The project depends mainly on existing research in the field to establish conceptual foundations for future development of automated timetabling systems adapted to University of Central Asia requirements.

Keywords: *Optimization, genetic algorithms, evolutionary algorithms, scheduling, timetable, fitness function, linked list, graph, frontend, backend.*

HEART EMERGENCY SOS MOBILE APPLICATION FOR SAMSUNG GALAXY WATCH USING FIREBASE REALTIME DATABASE

ERMEK ILIKESHOVA

The Parent Wellness Tracker introduces an innovative approach to elderly health monitoring by combining health data visualization with caregiver collaboration and alert systems within a single mobile platform. The application architecture was designed to work with health monitoring devices, with the current implementation using simulated sensor data to demonstrate the system's core functionality and user experience.

Unlike existing solutions, this application emphasizes the integration of health monitoring capabilities alongside personalized caregiver support, addressing critical gaps in usability and accessibility for senior users. Developed using Kotlin in Android Studio with Jetpack Compose for modern UI implementation, the application leverages Firebase for authentication, data synchronization, and cloud-based threshold monitoring, establishing a foundation for effective health tracking and alerts.

Designed with input from caregivers and elderly users, the system incorporates user-centered design principles, including simplified interfaces, larger text elements, and intuitive navigation, to overcome barriers such as low information literacy. The caregiver-patient relationship model enables effective health monitoring coordination between family members and care providers through a bidirectional permission system implemented in Firebase Firestore.

The application underwent evaluation through simulated health scenarios and usability testing with potential caregivers, demonstrating the viability of the core concept. While this prototype focuses on demonstrating the end-to-end user experience with simulated data, the underlying architecture is structured to accommodate real device integration in future iterations.

By providing a working prototype that showcases health monitoring visualization with effective caregiver collaboration, the Parent Wellness Tracker demonstrates a practical solution for integrated elderly health management, establishing a foundation for enhanced monitoring capabilities in subsequent development phases.

Keywords: *Firebase Firestore, Wellness Tracker, Visualization, Health Monitoring, Alert System*

WISDOMDISK.COM: INTEGRATING INTELLIGENT FILE STORAGE WITH CONVERSATIONAL AI

ILKHOMZHON SIDIKOV

In the age of ever increasing volume of data, management and retrieval of unstructured data is turning into a big challenge for human and also for the organization. Most existing file sharing applications, e.g., Google Drive and Dropbox, have naïve file storage and keyword-based search functions, but are unable to provide smart retrieval that can understand contextual queries. Recent advances in AI, especially in the area of Natural Language Processing (NLP) and Retrieval-Augmented Generation (RAG) models bring hope for semantic information retrieval. However, few such new features have been successfully incorporated into current file storage systems. In this paper, we address this problem and propose WisdomDisk.com is a natural language file storage platform with AI that lets you upload, manage and fetch files on using natural language queries with context. The envisioned platform includes a modular structure consisting of four layers: storage,ingestion, retrieval, and conversation. The storage layer supports the safe uploading, indexing, and storing of multiple file types such as PDF, DOCX, MP4, MP3, and PPTX. The retrieval layer uses FAISS-based dense vector storage systems for the indexing of document embeddings extracted from open-source models like Llama 4 - Maverick (Radford et al., 2020). The setup supports both efficient similarity-based and semantic retrieval methods. For a more enhanced conversational user experience, WisdomDisk.com supports Retrieval-Augmented Generation pipelines as well as a hosted R2R (Reason-to-Retrieve) service, allowing users to interact with intelligent chatbots powered by FastAPI. The platform supports enhanced accessibility through multiple languages for interactions such as English, Russian, Uzbek, and Kyrgyz by including automated transcription services for video and audio content through the whisper API of OpenAI (Radford et al., 2023). The system deployment leverages containerized architecture through Docker, which is run from cloud services such as AWS S3 for scalability and security. Redis caching and asynchronous PostgreSQL database operations using asyncpg are used to enhance response time and maintain data integrity. Authentication is achieved through secure OAuth2-based token verification to protect user data based on GDPR regulations (Voigt & von dem Bussche, 2017). For evaluation, the prototype showed successful document retrieval with a mean query response time of under 2 seconds and achieved more than 85% relevance accuracy on a test 4 collection of academic papers, business reports, and technical guides. Whisper-based transcription services achieved a word error rate (WER) of less than 12% for various languages, surpassing baseline automatic speech recognition (ASR) models used in comparable systems, as shown in

Summing up, WisdomDisk.com is a novel, smart approach to addressing the storage and retrieval needs of modern files by incorporating RAG-enhanced search, conversational AI, multi-lingual processing, and multimedia transcription. The undertaking not only reaffirms the potential of including top-of-the-line AI into the storage mechanism but also sets grounds for extending this into collaborative knowledge management and corporate search systems down the road.

Keywords: *FastAPI, AI, WisdomDisk, RAG, Open AI*

LIFT FOR ALL : A RIDE-SHARING PLATFORM FOR LOW-INCOME INDIVIDUALS

ISKENDER MAZHITOV

Low-income people (the poor) face difficulty in accessing affordable transport, especially inter-city travel. This Ride-Sharing Platform for Low-Income People fulfils this need through providing a non-commercial charitable alternative to one. This platform was not designed to earn a profit. In contrast to the profit-centric companies YandexGO, Lyft, Uber and inDrive that charge the community commission and fare based , this one will not. Drivers are encouraged to give free or inexpensive rides, supported by a reward program through corporate partners. This enhances corporate responsibility and mutual aid. This system allow users to register, book a ride, track a ride, manage efficient route. This site uses JavaScript with React for front-end coding and Node.js for backend codes and PostgreSQL for data coding. Currently, the software is operating only in Kyrgyzstan. Ready to go worldwide. The methodology of RAD or rapid application development develops prototypes of parts of projects in consultation of user. This platform will have no commercial elements but a charter to continually fire up the user with a reasonable eco-friendly travel deal. More features will be added that can track users better while furthering reward alliances will gain global use.

Keywords: *ORD, YadexGo, Uber, RAD, transportation*

DEVELOPMENT AND IMPLEMENTATION OF A TIMESHEET WEB APPLICATION FOR EMPLOYEE GRANT MANAGEMENT AT UCA

JASURBEK SADIEV

A multipurpose Timesheet Web Application provides user-friendly security for staff work report submission while supporting supervisor authorization functions. The application used a contemporary framework consisting of React.js and Tailwind CSS together with Golang and Node.js supported by SQLite and Nginx. The Timesheet Web Application contains essential features for user registration combined with timesheet posting along with approval workflows managed by supervisors and RBAC security measures and JWT authentication and notifications about timesheet status via email. Through the application users retain access to month-specific timesheet submission before records secure their status as locked either at submission or following supervisor approval. Different kinds of tests such as unit testing, system testing, user acceptance testing, and performance evaluation were used to prove system functionality together. Our time-tracking system fulfills its key requirements effectively, but future development includes moving to PostgreSQL as the primary database together with real-time features through Web Sockets and 2FA protection to reach maximum security and scalability.

Keywords: *Timesheet Management, Web Application, React.js, Tailwind CSS, Golang, Node.js, SQLite, JWT Authentication, Role-Based Access Control (RBAC), Supervisor Approval System, Secure Web Development, Performance Testing, Future Scalability.*

DEVELOPMENT AND IMPLEMENTATION OF AN ONLINE TRIP BOOKING PLATFORM (BETTATRAVEL) WITH EQUIPMENT RENTAL SUPPORT

MUNIS SAIDRAHMONOV

Travel and tourism e-commerce has expanded rapidly worldwide, yet it remains largely underdeveloped in Central Asia—particularly in Tajikistan, Kyrgyzstan, and Uzbekistan. The region's e-commerce infrastructure is hindered by limited local online booking platforms and significant constraints in digital payment capabilities. As a result, local tour operators either depend on international travel marketplaces that impose high commission fees or must resort to direct bookings via manual bank transfers. These approaches are highly inefficient, incur significant transaction costs, and provide minimal recourse for cancellations or refunds, ultimately undermining user experience and trust in the booking process. This project presents BettaTravel – an online trip booking platform with integrated equipment rental support – as a standalone solution to these challenges. BettaTravel enables local tour operators to manage their tour listings and bookings independently, accept secure online payments, and offer equipment rentals alongside trip packages on a unified web interface. By eliminating reliance on intermediaries and automating the booking process, the platform significantly reduces transaction costs and fosters greater trust between travelers and service providers. It also improves transparency by clearly outlining trip details and offering flexible, well-defined cancellation and refund policies. It also enhances user convenience by providing a comprehensive platform combining tour bookings with equipment rental options. BettaTravel provides a more efficient, reliable, and user-friendly experience for tourists and operators, and its model can potentially be replicated across the broader Central Asian tourism industry facing similar constraints.

AN INNOVATIVE AI-POWERED MOBILE AND WEB PLATFORM THAT CONNECTS PEOPLE WITH PROFESSIONAL CHEFS FOR HOME DINING EXPERIENCES AND EXPERT-LED COOKING LESSONS

RAMIL SALIHAR

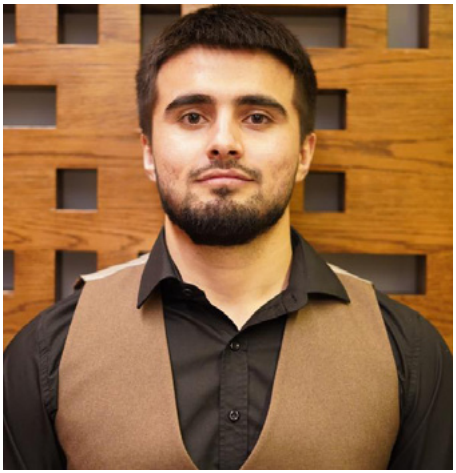
This research paper introduces an innovative AI-powered mobile and web platform designed to transform the culinary landscape by creating an ecosystem connecting consumers, professional chefs, and culinary content creators. The platform addresses critical gaps in the current market: separation between cooking education and professional chef services, limited monetization opportunities for cooking experts, and restricted access to personalized culinary experiences for consumers. Through AI integration, the platform delivers personalized chef-client matching based on customer preferences, dietary restrictions, and budget considerations while simultaneously offering learning opportunities that respond to users' skill progression, learning pace, and cooking interests.

The global online food service market, valued at approximately $130 billion in 2022 with projected growth of 11.5% CAGR through 2032 (Bridge, 2023), combined with the expanding e-learning industry, creates a convenient environment for this integrated solution. Primary research conducted with 150 potential users and 45 professional chefs showed significant demand for a unified platform and enthusiasm among culinary professionals for additional revenue streams. The platform leverages multiple AI technologies, including collaborative filtering recommendation systems, natural language processing for recipe customization, computer vision for technique analysis, and predictive analytics for demand forecasting.

This study employs a mixed-methods research approach combining qualitative user interviews with quantitative analysis of platform interaction data. The iterative development methodology incorporates continuous feedback mechanisms to refine both the user experience and AI algorithms. Beyond addressing immediate market needs, this research contributes to emerging theoretical frameworks in two-sided marketplace dynamics, AI-enhanced personalized education, and the evolving gig economy in specialized service sectors. The platform's new revenue-sharing model, with open fee structures and performance-based incentives, constructs enduring value for all parties within the ecosystem without sacrificing competitive prices to end users. This publication has profound consequences for culinary knowledge sharing, monetization, and access in a rapidly digitalized economy.

DESIGN AND IMPLEMENTATION OF A CENTRALIZED WEB-BASED SYSTEM FOR MANAGING THE CO-OPERATIVE EDUCATION PROGRAMME AT THE UNIVERSITY OF CENTRAL ASIA

RAUF ALIBAKHSHOV



Co-operative Education (Co-op) provides university students with a crucial opportunity to integrate academic theory with practical work experience (Careers with INDOT, 2021). The University of Central Asia (UCA) utilizes its Co-op program to enhance student skill sets and improve career readiness before and after graduation. However, traditional manual administration methods for these programs often introduce considerable obstacles, resulting in operational inefficiencies, communication bottlenecks between stakeholders, and substantial administrative demands.

Addressing these operational shortcomings at UCA is the focus of this thesis, which documents the development of a dedicated web application. The application's central function is to streamline and automate core Co-operative Education processes, thereby supporting the program's diverse participants: students, faculty supervisors, administrative staff, and representatives from partner companies.

Development leveraged the Python language and Django framework, structured around the Model-View-Template (MVT) pattern. A RESTful Application Programming Interface (API), built with the Django REST Framework, was incorporated to facilitate future integrations. Key technologies utilized in the system include JSON Web Tokens (JWT) for secure authentication, PostgreSQL as the production database, Celery for managing asynchronous operations, and Redis for caching and message brokering. Furthermore, the application integrates with external services, specifically AWS for cloud-based file storage and the Telegram messaging service.

Keywords: *Co-operative Education, Web Application, Django Framework, Django REST Framework, Celery Task Queue, Telegram Bot Integration, Role-based Authentication, PostgreSQL, Redis, Railway Hosting.*

DEVELOPMENT AND IMPLEMENTATION OF MOBILE APPLICATION OF ONLINE NORATY SYSTEM

SHOKHRUKH DAVLATMAMADOV

The Online Notary System is a project made with digital tools that make it easy to certify documents without needing to meet the notary in person. This product is especially useful for people who cannot visit a notary office because of their location, disability, or lack of time. The platform is designed to follow all legal and official rules, making sure the notarization process is fully legal while also being easy and user-friendly. The system allows users to confirm their identity using a safe and trusted method. They can use a passport or a driver's license issued by the government. This step is the basis for securely uploading and storing documents in the system. Through live video calls, the notarization process happens when the notary checks the person's identity, watches them sign the document, and then adds their own digital signature using electronic signature technology, supported by legally approved APIs. The Online Notary System not only solves problems of access, but it also makes a notary's job easier. It helps them do their work without the high cost of in-person services. In addition, it uses encryption and secure cloud storage to keep all user data and documents safe from unauthorized access. The Online Notary System offers tools like secure video calls, digital signatures, and encrypted storage while lowering costs, following legal rules, and providing a better solution compared to traditional notarization methods

Keywords: *online notary system, remote access, notarization, digital signatures, video conferencing, authentication, biometric authentication, secure platform, legal compliance, document storage.*

COMPREHENSIVE APPROACH FOR EXTREME WEATHER EVENT FORECASTING BASED ON MACHINE LEARNING AND DATA SCIENCE TECHNIQUES

TARIQ AZIZ

In recent years, we have seen clear signs of climate change and its worldwide impact. The frequency and intensity of various natural disasters, such as avalanches, landslides, and droughts, have drastically increased. Traditional disaster prediction techniques are not efficient and often lack accuracy. We are predicting avalanches, landslides, and droughts using machine learning. We have also created a user-friendly web app and Telegram bot for real-time risk alerts. It's going to help meteorologists and people living in disaster-prone areas. Our dataset consists of environmental variables and relevant meteorological features. As part of the training process, we tried different machine learning algorithms. The ultimate choice of algorithm was based on performance. Our web application also provides interactive visualizations. These visualizations are essential for in-depth analysis of risk assessment. Our project provides a comprehensive solution for disaster predictions. The use of machine learning enhances the reliability of predictions made. Our goal is to help local communities, decision makers, and emergency responders.

Keywords: *Disaster Prediction, Drought Forecasting, Landslide, Avalanche, Machine Learning, Ensemble Methods, Interactive Dashboard, Real-Time Prediction, Telegram Bot, Natural Disaster.*

WEB SERVICE ANALYTICS AND INVENTORY MANAGEMENT SYSTEM FOR MARKETPLACES

UMAR NUROV

The Web Service Analytics and Inventory Management System is a web-based platform designed to enhance the operational efficiency of e-commerce sellers on platforms like Wildberries, Ozon, and Yandex Market. The system automates inventory tracking, sales analysis, and advertising management while providing real-time reporting and actionable insights. The key features of the project include barcode generation, API integration for data synchronization, and dashboards for monitoring stock levels and sales performance. This project lays the foundation for future AI-driven analytics (SalesGPT), offering predictive insights to optimize decision-making and promote business growth. By streamlining essential processes and addressing common inefficiencies, the system empowers sellers to navigate marketplaces effectively, scale their operations, and achieve long-term success.

Keywords: *E-commerce Platforms, Inventory Management, Sales Analytics, Barcode Generation, API Integration, Automation, Predictive Analytics, Cloud Infrastructure, Business Insights, Software Development, Real-time Reporting.*

DEVELOPMENT AND IMPLEMENTATION OF WEB APPLICATION FOR UCA WAREHOUSE SYSTEM

UMIDBEK ULMASOV

At present the University of Central Asia (UCA) operates warehouse operations manually through its obsolete management system causing both slow performance and high potential for order errors. The authors propose developing a modified digital Warehouse Management System (WMS) through centralization to fulfill the specific requirements of university operations. The main functions of the system will perform automated inventory optimization while boosting order speed and accuracy alongside immediate multi location warehouse tracking capabilities. The system design employs web-based architecture through the combination of Python Django for system backend development and ReactJS for front end development. The chosen technology stack creates an application that delivers scalability and high performance alongside security along with a modern user interface for better user experience. Programming the system enables error reduction through automation processes which also enhances workflow organization and creates consistent data alignment in between departments The proposed WMS enables UCA to base their critical decisions off real-time information through analytics thus delivering timely decisions. The proposed system delivers substantial advantages for accountability together with traceability and operational transparency across the organization. The digital system at UCA creates a solid technological framework to fix present challenges and enable future university expansion beyond basic smart solution deployment. This system represents a key digital transformation strategy which makes UCA a progressive university ready to use technological developments for enhancing both its internal processes and service quality. Keywords: Warehouse Management System, Inventory Management, University Logistics, Web Application, ReactJS, Python Django, Automation, Digital Transformation.

Keywords: *Warehouse Management System, Inventory Management, University Logistics, Web Application, ReactJS, Python Django, Automation, Digital Transformation.*

A MULTI-APPROACH MODEL FOR LEISHMANIASIS DISEASE CLASSIFICATION BASED ON MACHINE LEARNING AND DEEP LEARNING ALGORITHMS

ZAKIR HUSSAIN MURADI

Cutaneous Leishmaniasis (CL) is a neglected tropical disease, and its diagnosis has become one of the biggest challenges, especially in resource-poor settings. This work presents a novel integrated use of CNN, feature extraction, and transfer learning to improve accuracy and efficiency regarding the diagnosis of CL and prediction of outbreaks on the positive or negative microscopic images. It is directly fed to CNN and transfer learning model for high-level microscopic image analysis to classify the Leishmaniasis cases based on three-channel microscopic images. However, in the feature extraction process, firstly, statistical features are extracted from images of skin lesions and fed to traditional machine learning algorithms together with a combination of all three-channel strategy for more robust predictions.

Several traditional machine learning algorithms including Random Forest, XGBoost, k-Nearest Neighbors (KNN), Decision Tree, and Naive-Bayesian have been employed for classification based on the extracted statistical features. This integrative model can diagnose CL with high accuracy, enhanced precision, and scalability for a cost-effective and deployable solution in resource-constrained healthcare environments. The comparison shows that feature extraction model performs better than CNN and transfer learning models on numerous performance metrices. The presented findings give emphasis on how hybrid machine learning techniques in the future will alter the diagnostic and therapeutic management of diseases and shall form a conduct for further investigation into AI-driven medical diagnosis.

Keywords: *Cutaneous Leishmaniasis, Convolutional Neural Networks, Transfer Learning, Machine Learning, Deep Learning, Random Forest, XGBoost, k-Nearest Neighbors, Decision Tree, Naive-Bayesian, Image Classification, Disease Prediction, Medical Diagnostics, Resource-Limited Settings.*

Earth and Environmental Sciences

DEFORMATION IN SHOKHDARA GNEISS DOME, SOUTHERN PAMIR MOUNTAIN, TAJIKISTAN

DAVLAT DAVLATOV

The deformation structures in the Shahdara Gneiss Dome of the southern Pamir Mountains of Tajikistan are analysed in this study to gain insights into its tectonic history of the India–Asia continental collision. An integrated methodology involving synergistic methods of detailed field mapping, sampling and analysing at the mesoscopic scale, and petrography was used in the macro-, meso-, and microscopic domains. The structural data from the outcrops along the Gunt river, particularly near Barsem village and in the Dashti Bolo, district indicated a set of ductile deformations ranging from S–C fabrics to augen gneisses, to boudins as well as to sigma clasts and Z-shaped folding structures consisting of high-temperature shear compatible with amphibolite-facies metamorphism. The dynamic recrystallization was confirmed by thin-section studies and mica fish and chessboard extinction in quartz and strain shadows developed around garnet porphyroblasts supporting deformation at the mid-to-lower-crustal levels. The kinematic indicators across the study region are indicative of prevailing dextral shear in synchronization with the regional impact of the Karakoram Fault system. The localization of strain in the shear zones and the traces of opposite shear directions are a sign of dominantly deep crustal flow as also the influence of the force of gravity in exhumation of the dome. These data increase our knowledge on the structural building and the kinematic framework of the Shahdara Dome and contribute to insights into the larger domains of the Pamir-Himalaya-Tibet system in terms of the behavior of the crust during continental collision and orogenic events.

Keywords: *Shahdara Gneiss Dome, Shear zones, Southern Pamir Mountains, Ductile deformation*

GEOCHEMISTRY OF BLACK SHALES OF VAMAR FORMATION IN PAMIR, TAJIKISTAN; PROVENANCE, SOURCE WEATHERING AND TECTONIC SETTING

AZIZ MAMADSALIMOV

Geochemistry, petrogenesis and tectonic setting of the black shales of the Vamar Formation were chosen as a case study in the Southern Pamir, where a comprehensive analysis of the sedimentology, petrography and geochemistry - in concentrated aspects of major oxides, SEM-EDS and ICV, CIA and DF1–DF4 indices- enables us to elucidate the paleoenvironment, provenance and tectonic setting of the studied black shales. The provenance analysis points to quartz sedimentary and intermediate magmatic inputs under moderate chemical weathering typical of temperate environments, which not only physically weathered but also chemically altered the source rocks. Detrital quartz and biotite together with organic graphite present in the sediment, as determined by petrography and SEM-EDS analysis, suggest an anoxic condition. Geologically, shales occur along the active continental margin to the edge of a continental volcanic arc. This study extends our knowledge of the sedimentary history of the Southern Pamir Basin and examines how black shales form in high mountain orogenic regions.

Keywords: *Vamar Formation, Southern Pamir, SEM-EDS, ICV, CIA, DF1, DF4, Detrital Quartz*

ROCK GLACIER AND PERMAFROST DYNAMICS IN THE EASTERN PAMIRS: INSAR, ERT, AND CLIMATE-BASED ANALYSIS IN MURGHAB AND SHUGNAN

NAJIBA MAQBULSHOEVA

Permafrost degradation is emerging as a critical environmental concern in the high mountain regions of Central Asia, in particular due to the increasing temperatures and changes in the snow regimes. This thesis focuses on how the dynamics of permafrost as well as rock glaciers would be different in two climatically distinct districts of Tajikistan: Murghab in the Eastern Pamir and Shugnan in the Western Pamir. In order to evaluate the distribution, activity, and potential hazards represented by rock glaciers in both regions, remote sensing methods such as Interferometric Synthetic Aperture Radar (InSAR) and Geographic Information Systems (GIS), are employed as well as local climate data and geomorphological studies. The results demonstrate that Murghab's high elevation (>4000m), along with its cold-arid conditions sustain a higher number of intact rock glaciers that are consistent with the presence of continuous permafrost. In contrast, Shugnan, with lower elevations and a milder climate, has more relict or weakly active features, reflecting discontinuous or degrading permafrost. According to InSAR analysis Murghab rock glaciers move with a seasonal surface offset of 30 cm/year, whereas Shugnan rock glaciers show slower displacement in the range of 3–10 cm/year. Such differences may be attributed to snow cover and terrain nature.

The study demonstrates the effectiveness of remote sensing and spatial analysis for detecting and monitoring permafrost-related landforms in data-scarce, high-altitude environments. By identifying key environmental drivers of rock glacier evolution and potential hazard zones, the findings contribute to a better understanding of cryospheric change in the Pamirs and provide a basis for future risk assessments and climate adaptation planning in mountainous regions of Tajikistan. It is important to note that the most recent major debris flow events in Tajikistan have been directly linked to permafrost degradation. Notably, the incidents near the village of Barsem in the Shughnan District (2015) and the village of Medenved in the Roshtkala District (2023) were primarily triggered by intense thawing of perennially frozen ground, which played a key role in initiating and mobilizing debris flow.

Keywords: *permafrost degradation, rock glaciers, InSAR, GIS, Pamir Mountains, climate change, cryosphere monitoring, Tajikistan, high-altitude hazards, spatial analysis*

ASSESSING THE RISK AND EVOLUTION OF GLACIAL LAKES IN YASHILKUL BASIN, PAMIR, TAJIKISTAN USING LANDSAT IMAGERY

SHUKRONA MULLOEVA

This diploma thesis assesses the evolution and glacial lake outburst flood (GLOF) risk of 14 glacial lakes in the Yashilkul Basin, Pamir, Tajikistan, using Landsat imagery and GIS-based methods. The research aims to examine temporal changes in lake area (1990–2024), classify lake types, identify potentially dangerous glacial lakes (PDGLs), and evaluate GLOF risk through a multi-criteria approach. NDWI analysis delineated lakes in 2024, revealing a total area of 2.8254 km², with YKB_GL12 being the largest (1.7409 km²). Lake volumes ranged from 11,667.64 m³ to 75,670,297.36 m³. Manual classification identified YKB_GL01 and YKB_GL08 as ice-contact and end-moraine-dammed, marking them as PDGLs. Temporal analysis showed a net area increase of 5.56% over 34 years, with expansions in YKB_GL01 (+0.0953 km²) and YKB_GL08 (+0.0198 km²), though YKB_GL12 contracted (-0.0288 km²). GLOF risk assessment using the Analytic Hierarchy Process (AHP) yielded a hazard score of 0.8410 (high) for YKB_GL01 and YKB_GL08, a downstream impact score of 0.25 (low), and an overall risk of 0.5455 (moderate). These findings highlight the influence of glacier retreat on lake dynamics and underscore the need for continued monitoring in the Pamirs. The research aligns with Tajikistan's glacier preservation efforts, supporting disaster risk reduction and early warning systems to protect vulnerable communities and infrastructure.

Keywords: *Glacial lakes, GLOF, Yashilkul Basin, Landsat imagery, NDWI-based, risk assessment, evolution, classification*

AMAZONITE FROM THE MURGHAB AREA, TAJIKISTAN; MINERALOGICAL AND GEMOLOGICAL CHARACTERISTICS

SHAFOAT JAFOEVA

The present thesis focuses on documenting mineralogical and geochemical features of pegmatites in the Kukurt area, Murghab region, Eastern Pamir Mountains, Tajikistan which contain amazonite. The study integrates field and hand specimens and geochemical data that define the nature and origin of amazonite in NYF-type pegmatitic systems. Fieldwork uncovered well developed pegmatite dikes of up to one meter thickness with mineral assemblages being dominated by amazonite (green microcline), albite, quartz, biotite and tourmaline. Geochemical analysis based on the technique of ICP-MS element extraction technique and the XRF technique show high concentration of K_2O, Rb, and Pb, which confirms the assumption that Pb^{2+} substitution and structural defects favor the coloration of amazonite. Normative multi-element diagrams to primitive mantle and chondrite standards indicate enrichment in large ion lithophile elements (LILEs) and light rare earth elements (LREEs) depletion of high field strength elements (HFSEs) and heavy rare earth elements (HREEs) thus correlating with feldspar dominated crystallization trend observed in evolved pegmatite. The results imply a lack of significant fluid interaction during late-stage crystallization, and they confirm their genetic scheme as NYF-type pegmatites produced under moderate to high degrees of magmatic fractionation. The scope of this study contributes to the knowledge concerning the formation of amazonite in Central Asia as well as the value-based significance of Kukurt area in mineralogical and economic terms.

Keywords: *Amazonite, Kukurt, Eastern Pamir, NYF-type Pegmatite, Crystal Chemistry*

GIS-BASED LANDSLIDE SUSCEPTIBILITY ASSESSMENT ALONG THE GHIZER–CHITRAL EXPRESSWAY USING THE WEIGHT OF EVIDENCE MODEL

KAMAL UD DIN

Landslides are one of the most common natural hazards in mountainous regions like northern Pakistan. According to Shabbir et al. (2023), Pakistan experienced 1,089 landslides (including 180 fatal) from 2003–2019, the Gilgit–Baltistan districts of Baltistan and Diamer accounted for about 39.6% of these events. This research focuses on the Ghizer–Chitral Expressway corridor, a high-risk infrastructure project currently under construction in the fragile mountain environment of northern Pakistan. The study uses a GIS-based approach and applies the Weight of Evidence (WoE) statistical model to identify and map landslide-prone areas along the expressway. The primary goal is to support safer planning, infrastructure development, and hazard mitigation in the region by producing a high-resolution landslide susceptibility map. A set of topographic, geological, and geomorphological factors was selected based on data availability and literature. These were used to model landslide susceptibility through the Weight of Evidence (WoE) method, based on digitized landslide and non-landslide areas. The final Landslide Susceptibility Index (LSI) map was classified into zones and validated using a success rate curve. The results showed that certain topographic and geotechnical factors had a stronger association with landslide occurrences than others. The model demonstrated good predictive accuracy, with an Area Under Curve (AUC) value of 0.8048. This level of performance is consistent with similar studies that have applied the Weight of Evidence method in mountainous regions, supporting the reliability of the approach even in the absence of field-verified data. The study complements the effectiveness of the WoE model in the understanding of landslides. Overall, the study provides scientific insights into which environmental factors drive landslides in this region and produces a useful landslide risk map

Keywords: *Landslide susceptibility, GIS, Weight of Evidence, Ghizer–Chitral Expressway, remote sensing*

ASSESSING THE IMPACT OF CLIMATE VARIABILITY ON VEGETATION AND SEDIMENT DYNAMICS IN THE GUNT RIVER BASIN, PAMIR, TAJIKISTAN. EVIDENCE FROM NDVI, MSAVI, TSS MONITORING, AND HISTORICAL CLIMATE TREND ANALYSIS

MUHAMMADSHARIF ISMOILOV

This study investigates the combined impacts of climate variability on vegetation patterns and sediment transport in the Gunt River Basin, situated partly in the Western and Eastern Pamirs of Tajikistan. Using a mixed-methods approach that combines long-term field measurements, historical climate records, and satellite imagery, we assess how variation in temperatures and altered precipitation patterns influence land cover and river sediment dynamics. Vegetation cover changes between 2015 and 2024 were analyzed using NDVI and MSAVI indices derived from Landsat 8 and 9 imageries, revealing an expansion in sparse vegetation. Field-based sediment sampling from 2021 to 2024 (and first 2 months of 2025), using the Gravimetric Method for Total Suspended Solids (TSS), revealed seasonal and interannual variations, with peak turbidity during summer months aligning with snow and glacial melt. These modern values were compared with historical turbidity data from the 1980s, revealing a marked increase in recent sediment loads and variability. Furthermore, Mann-Kendall trend analyses of climate data from three stations across different elevations indicate statistically significant warming trends, particularly in lower elevations. The integration of climatic, hydrological, and vegetation data provides novel insight into how climate variability alters high mountain environments. The results underscore the importance of continuous environmental monitoring and adaptive land and water resource management in Central Asia's fragile alpine catchments.

Keywords: *Climate variability, Gunt River Basin, Eastern Pamirs, NDVI, MSAVI, sediment transport, Total Suspended Solids (TSS), Mann-Kendall trend analysis, glacial melt, alpine hydrology, land cover change, remote sensing, environmental monitoring, Central Asia.*

ASSESSMENT OF IRRIGATION WATER PERFORMANCE IN BARZUD, DERZUD, AND BARUSHON VILLAGES OF THE RUSHAN DISTRICT BY USING GIS AND REMOTE SENSING

NAZARKHOTUN ANOYATSHOEVA

Irrigation water is an important factor in agricultural productivity, especially in the arid and semi-arid zones, where irrigation mostly relies on water from glaciers and rivers. In recent years, the changes in the climate and precipitation have posed a threat to the availability of water, therefore, it is important to understand the current trend of water availability and provide solutions for further development. The following research aimed to assess the water availability in Derzud, Barzud and Barushon villages of the Rushon district during 2019, 2022, and 2023 years through GIS and Remote Sensing. The performance of the irrigation water was assessed based on the water stress index, equity, and reliability of the water supply. The data for the analyses were obtained from the EEFlux platform for actual evapotranspiration and from the MOD16 database for potential evapotranspiration. Further, the data was processed by using GIS tools. For climatic data analyses, the data was taken from the ERA5-Land monthly aggregated dataset provided by the European Centre for Medium-Range Weather Forecasts (ECMWF) through Google Colab and Google Engine Platforms. The analyses showed that during 2019, the villages were under high water stress. In 2022, the situation improved due to the change in precipitation, temperature, and the building of the new irrigation infrastructure. However, in 2023, again, a moderate to high level of water stress was detected in some parts of the region. The interviewees did not mention any water shortage issues during 2023. Therefore, it was concluded that, since the amount of croplands under stress was small, the water availability was enough to meet crop water requirements.

USING REMOTE SENSING DATA AND GIS TO IDENTIFY GLACIER CHANGE IN GUNT RIVER BASIN SINCE THE 1990S

RUSLAN RIKAMOV

Many of the region's glaciers are in the eastern Pamir Mountains of Tajikistan and form essential sources of freshwater for ecosystems and communities that live along rivers downstream (Pohl et al., 2017). Faster glacier melting leads to greater potential for glacial lake outburst flooding, which has become a bigger problem in the region (Mergili et al., 2012). The present investigation analyses the change of glaciers in GRB during the timeframe of 1998 through 2024, especially in terms of how much area and volume they have lost over time. It also explores how climate factors such as temperature and precipitation trends from three meteorological stations are affecting glacier behaviour. In addition, this study explores how aspects, slope, and elevation are contributing to glacier melting. Long-term observations and glacier mapping using GIS techniques have become more efficient. Remote sensing data (Landsat imagery, ASTER GDEM) and statistical trend analyses were used to determine the glacier extents and topographic influences, as well as climate variability. Although there were variations in the temperature at each station, most of the areas experienced a warming trend over the study period. These results emphasize the need for continuous glacier observation in respect to terrain and climatic aspects. The data collected in this study can be useful for disaster risk reduction, water management and regional climate change adaptation plans for the Pamir region.

Keywords: *NDSI, GLOF, Men-Kendal Trend Test, GRB*

ESTIMATION OF PM2.5 AND PM10 CONCENTRATION IN KHOROG: INTEGRATING METEOROLOGICAL DATA, GIS, AND REMOTE SENSING ANALYSES

SHUKRONA ALINAZAROVA

PM2.5 and PM10 are among the most harmful pollutants because of their significant impact on the environment and human health. In high altitude town like Khorog, Tajikistan no research has been conducted on concentration and distribution of PM2.5 and PM10. The purpose of this study is to estimate PM2.5 and PM10 level and distribution during different seasons in Khorog. The study uses Landsat 8 imagery and ground data to find out the temporal and spatial distribution of these pollutants. Meteorological data such as temperature, humidity, precipitation, wind direction and speed will be used to correlate with PM2.5 and PM10. The findings shows that the high concentration of both PM2.5 and PM10 is during summer and the lowest is during autumn. Winter season was not used in this study due to absence of the data for this season. Meteorological data mainly correlated with the level of PM2.5 and PM10 in the autumn period. The results of the study can contribute to future environmental planning and study of dynamic behaviours of particulate matter in the mountainous regions.

Keywords: *Particulate matter, health, meteorological variables, correlation, PM2.5, PM10, satellite data*

ENSURING THE LONG-TERM SUSTAINABILITY OF THE CHARTHEM HYDROPOWER PLANT IN THE FACE OF CLIMATE CHANGE: A GBAO CASE STUDY

AMINA KALANDARBEKZODA

This thesis investigates the long-term sustainability of the Charthem Hydropower Plant (HPP), a planned 15 MW run-of-river facility located in the Gunt River basin of Gorno-Badakhshan Autonomous Oblast (GBAO), Tajikistan. Given the region's vulnerability to climate change and widespread energy poverty, the study evaluates environmental, social, and economic dimensions using the Hydropower Sustainability Standard (HSS) as the primary assessment framework. For the study, a multi-dimensional approach was used, incorporating GIS techniques along with hydrological modeling, interviews with key stakeholders, and the application of analytic methods regarding flood frequency, seasonal flows, and ANOVA, water quality analyses. Findings reveal that while the Charthem HPP benefits from reliable glacial-fed discharge during summer, limited winter flows pose operational challenges during periods of peak demand. Social assessments also highlight that there is a lot of support behind the project, largely because of expectations of improved access to power, employment opportunities, and improved standards of living. Economically, the project demonstrates moderate viability, with a projected payback period of 27 years, though its financial sustainability remains sensitive to climate-induced flow variability and local tariff structures. The research highlights the significance of creating robust infrastructure and optimized ways of treating water and sediment resources following climate change. The report states that maintaining equitable sharing of benefits requires continued interaction with local communities. If the social and environmental issues are addressed in advance, the Charthem HPP can become a good model for sustainable hydropower in remote mountain regions.

Keywords: *Hydropower Sustainability Standard (HSS), Climate Resilience, Glacial-fed River, Economic Viability, Community Engagement.*

GEOCHEMISTRY OF THE SHUROB COAL DEPOSIT IN TAJIK TIAN SHAN: EVALUATING CONTAMINATION

NIGINA ISMATOVA

The evaluation of soil and water pollution caused by the mining activities of the Shurob coal deposit in Tajik Tian Shan aligns with Tajikistan's efforts in achieving SDGs, particularly SDGs 3, 6, and 15; and supports "Law on Subsoil", "Law on Industrial Safety of Hazardous Production Facilities", "Law on Coal", and "Regulation on State Service of Mining Supervision and Industrial Safety". The research was performed on the Shurob Mine #8 located in the Tajik Tian Shan to evaluate geochemistry of coal and its impacts on the surrounding environment, particularly on soil and water. XRF analysis was performed on coal, rock, and soil samples, and ecological indices were calculated for soil. Further, heavy metals were identified in soils, with Cu, Ni, and Zn exceeding WHO limits. Also, the earthworm avoidance test showed a 66.7% avoidance rate, indicating high toxicity in coal-affected soil. Based on pH measurements, mine water was more acidic than local drinking water, suggesting acid drainage. GIS maps revealed that mining runoff follows a specific downhill flow pattern, raising concerns for downstream pollution. These findings confirm that coal mining in Shurob has negatively impacted local soil and water quality. The study also proposes mitigation strategies, such as vegetation-based soil restoration and geo-touristic recreational zones.

Keywords: *coal mining, Shurob, Tajikistan, soil contamination, water pollution, XRF, GIS, earthworm avoidance test*

A SOURCE-TO-SINK ANALYSIS FOR THE SAREZ LAKE IN THE CENTRAL PAMIR: PROJECTIONS OF SEDIMENT DEPOSITION INTO THE FUTURE

LOIQ AMONBEKOV

Sarez Lake, formed by the catastrophic Usoi landslide in 1911 in the Pamir Mountains of Tajikistan, serves as a natural reservoir of immense geophysical and hazard relevance. This study applies a source-to-sink sediment modelling approach using the Landlab framework to simulate long-term erosion, sediment flux, and lake infill processes over a 1000-year period. The simulation is driven by remotely sensed digital elevation data (DEM), precipitation records, and geomorphic process parametrization. Results show that sediment influx into the lake ranges from an initial 71 million m^3/year, stabilizing at ~57–58 million m^3/year, while outflux remains negligible due to the basin's closed morphology. The lake accumulated 76.6 meters of material on average during 1000 years at a rate of 0.0765 meters per year. Using data from the zones that fill at the slowest rate the complete infilling process will require around 542,040 years. The results of sensitivity analysis show that sediment flux primarily depends on precipitation and uplift rates. The research supports disaster prevention planning while supplying insights for future water resource policies and illustrates why combined geomorphic modelling and climate forecasting is crucial for vulnerable mountainous reservoirs such as Sarez Lake.

Keywords: *Sarez Lake, sediment deposition, Landlab, landscape evolution, source-to-sink, erosion modelling, climate impact.*

NATURAL INSECT/PEST MANAGEMENT AND FOOD SECURITY: EXPLORING INDIGENOUS AROMATIC PLANTS AS NATURAL INSECT/PEST REPELLENTS FOR SUSTAINABLE AGRICULTURE IN KHOROG, GBAO

REZABEGIM SHOLAMOVA

Natural insect/pest management and food security: How implementing Indigenous aromatic plants as natural insect/pest repellents in the farms of Gorno Badakhshan Autonomous Region (GBAO) can contribute to sustainable agriculture and food security in the region? In the light of ongoing climate change, sustainable agriculture practices are becoming increasingly important, especially in vulnerable mountainous areas like GBAO. This study will explore the issue of insect/pest infestation in local farms of Khorog and surrounding villages. It will analyze the effectiveness of the aromatic plants in Khorog conditions. This is achieved through interviewing local farmers, analyzing existing data, and conducting soil analysis. Results show that 62.5% of the local farmers use chemical insecticides/pesticides, and they reported a negative impact on soil, crop, and human health. Almost all the respondents (90.6%) expressed interest in switching to this method of insect/pest repelling if proven effective. Implementing this method of dealing with infestation can lead to sustainable agriculture and food security as it is cost-effective, environmentally friendly, and an overall safe alternative to chemical insecticides/pesticides.

Keywords: *Infestation, food security, sustainable agriculture, insect/pest repellents.*

Global Economics

CRYPTOCURRENCY VS. TRADITIONAL INVESTMENTS

AMIN PIRMAMADOV

With high interest in cryptocurrencies, there have also been questions asked about how cryptocurrencies can be used as an asset class for portfolio diversification and optimization. This thesis analyzes their integration in portfolio management by means of Modern Portfolio Theory (MPT) answering the two following research questions: (1) Where in the portfolio construction do cryptocurrencies fit if they are to be considered in modern portfolio allocation together with traditional assets? (2) How diversified can a crypto portfolio be? 2016 to April 2025 return data both daily and monthly were gathered from Yahoo finance and CoinMarketCap and analyzed. Mean–variance analysis, maximum Sharpe ratio, minimum volatility targeting, and efficient frontier computation by SLSQP optimization were involved in methods. It is observed that the risk return behaviors of the traditional portfolio can be improved by including cryptocurrencies, and they shift the efficient frontier outward. Crypto only or traditional only portfolios never outperformed mixed crypto traditional portfolios. Crypto only portfolios have very poor diversification unless the portfolios are weighted heavily in stable coins, in some cases stable coins are the only assets included and sometimes Bitcoin and Ethereum are excluded from the optimal strategy. This shows cryptocurrency portfolio design opportunities and limitations. For crypto-only portfolios, asset selection must be thoughtful and considered very carefully, as mixed portfolios get considerable benefits from crypto. These insights are actionable for all such kind investors, portfolio managers as well as academics navigating the current complex digital asset environment.

Keywords: *Cryptocurrency, asset allocation, portfolio diversification, risk management, traditional investments, Modern Portfolio Theory, Financial Markets, portfolio optimization.*

REASSESSMENT OF MIMIC'S APPROACH TO MEASURING INFORMAL ECONOMY: EVIDENCE FROM THE CAUCASUS AND CENTRAL ASIA (2017)

ASLAN DAVLATBEKOV

This study is an update and reassessment of the informal economy in the Caucasus and Central Asia region using the Multiple Indicators-Multiple Causes (MIMIC) approach, building on and extending the influential analysis by Abdih and Medina (2013) using 2017 data. With the significant economic, institutional, and regulatory changes that have occurred from the time of the initial study, this study seeks to assess the contemporary relevance of the previously identified determinants - tax burden, labor rigidity, institutional quality, and regulatory burden in financial and product markets. Using structural equation modeling and a set of empirical strategies, the study presents updated estimates of the extent of informality and examines changes over time observed within the impact of the determinants. By confirming the robustness and validity of the MIMIC model methodology, this thesis enhances empirical knowledge and methodological rigor in measuring informality, providing valuable insights for policymakers seeking to develop targeted measures to promote sustainable economic growth and reduce informality in the Caucasus and Central Asia region.

SUB-NATIONAL AND SEASONAL VARIATIONS OF COST AND AFFORDABILITY OF RECOMMENDED DIET IN TAJIKISTAN

DILOFARID SHERJONOVA

In Tajikistan, access to nutritious food remains an obstacle. This study examines the regional and seasonal variations in the affordability and cost of a nutritious diet. This research uses over 42,000 food price records gathered from Agency of Statistics (Tajikistan) during 2012 and 2024. Around 10,247 CoRD values were determined for male, female, and children in 11 cities and 14 districts nationwide. Using the amount of money individuals typically spend on food, the Cost of Recommended Diet (CoRD) technique was used to determine how much money people need each day to eat healthily and assess affordability. The data contrasts both urban and rural locations and covers all four seasons. In urban regions, men's average daily cost was 19.4 TJS, whereas in rural areas, it was 13.6 TJS. This study found that autumn and spring are costlier —CoRD reached 30 TJS/day in Bokhtar in autumn of 2014 and 26 TJS/day in Khorog in the autumn of 2023. Affordability was an issue everywhere, despite lower pricing in rural areas due to lower salaries. Khorog had the highest affordability ratio hit 10.3 during the winter of 2013, which means that one would need to spend ten times as much as they would normally spend on food. Just 18.2% of CoRD values were within the reach of children. This study, the first in Tajikistan to use the CoRD technique to examine food affordability by season and location, helps identify the times and places when individuals most struggle to pay for a nutritious diet.

Keywords: *Recommended diet, healthy food, sub-national analysis, seasonal variations, Cost of Recommended Diet (CoRD), affordability of healthy diet, food security.*

SOCIOECONOMIC IMPACT OF SOLAR ENERGY IN MURGHAB

DILRABO RAIMOVA

This thesis evaluates the socioeconomic impacts of the 2020 solar photovoltaic (PV) mini-grid project implemented by Pamir Energy in Murghab, Tajikistan. Using a quasi-experimental before-and-after design and mixed-methods approach, it analyses data from 50 households. Quantitative analysis includes linear regression to estimate cost savings and logistic regression to understand fuel-switching behaviour. Descriptive statistics show that households saved on average 1700 TJS— 345.12 TJS per capita— on winter energy spending post-solar deployment. OLS regression results indicate that larger households using multiple traditional fuels saved the most, while income diversity improved savings unless accompanied by fuel mixing. Coal use remained common in large families but declined in those using many fuel types. Economic burden and income diversity alone were not strong predictors of continued coal use. While the project facilitated a clear shift from coal and biomass to cleaner energy, the limited sample size prevents broad generalization. Future research with a larger sample is recommended. Policy support such as subsidized electric heaters and reduced tariffs could further accelerate clean energy transitions in Murghab and similar other high-altitude communities.

Keywords: *Solar Energy; Socioeconomic Impact; Solar Mini-grid; Pamir Energy; Murghab, Fuel-switching.*

EXAMINING THE RELATIONSHIP BETWEEN TRADITIONAL IRRIGATION SYSTEMS AND AGRICULTURAL PRODUCTIVITY IN KHATLON, TAJIKISTAN: AN OLS APPROACH

FAKHIRA BAIG

This study examines the role of traditional irrigation systems in agricultural productivity in Khatlon Tajikistan, using cross-sectional data from 2,000 households. An Ordinary Least Squares (OLS) regression model is employed to examine how traditional irrigation systems canals, drainage canals, natural water sources, and public and private piped water-affect farm productivity and potato yields. The analysis also tests for interaction effects between irrigation methods and nitrogen fertilizer use on yields. Results reveal that traditional irrigation infrastructure remains crucial: natural water sources and canal irrigation are significantly associated with higher agricultural productivity, and a positive combined effect emerges when private piped water irrigation is combined with nitrogen fertilizer. These findings underscore the importance of investing in irrigation infrastructure and integrated water-nutrient management for sustainable agriculture in Tajikistan, providing insights to inform policies to enhance resilience and productivity in water-limited settings.

Keywords: *Traditional Irrigation Systems, Total Crop Value, Agricultural Productivity, OLS Regression.*

PREDICTION OF GDP GROWTH IN TAJIKISTAN USING LABOR MARKET INDICATORS, 2002-2023

FARHOD AKRAMOV

This paper aims to predict GDP growth in Tajikistan using labor market indicators using annual data from 2002 to 2023 with an ARIMAX estimation model. As Tajikistan continues to navigate its development trajectory, understanding the relationship between labor market variables and economic performance remains a critical component for policy formulation. Labor market key variables such as remittances, wages, employment, inflation, foreign direct investment, school enrollment, life expectancy, primary school completion, and interest rates are incorporated into a time series forecasting framework in the study. Data used in this research were obtained from the World Bank, National Bank of Tajikistan, and Statistical Agency under the President of the Republic of Tajikistan. The Augmented Dickey-Fuller test was used to test stationarity and determine necessary transformations. The research finds that a one-unit increase in average wages is associated with a 0.0042 increase in GDP growth, while higher inflation and life expectancy are linked to increases of 0.127 and 0.683, respectively. While the results offer valuable insights into the dynamic relationship between labor market conditions and GDP growth, the model's effectiveness is subject to certain limitations, including data constraints. Future research may build on this framework by incorporating more granular data and alternative modelling techniques.

Keywords: *GDP Growth, ARIMAX Model, Labor Market Indicators, Remittances, Wage, Employment, Foreign Direct Investment, Inflation, Education, Life Expectancy, Forecasting, Time Series Analysis, Tajikistan.*

MATERNAL EMPLOYMENT AND CHILD NUTRITION IN PAKISTAN: EVIDENCE FROM THE 2017–18 DEMOGRAPHIC AND HEALTH SURVEY

FARYAL NAYAB

Malnutrition among children under five remains a pressing concern in Pakistan, with nearly 38% stunted and 22% underweight, yet little is known about how rising maternal employment influences these outcomes. This study investigates whether maternal employment affects child nutritional status by analyzing nationally representative data from the 2017–18 Pakistan Demographic and Health Survey. Four key child nutrition indicators, stunting, underweight, wasting, and overweight, were examined using a combination of Propensity Score Matching, Ordinary Least Squares, and Instrumental Variables estimation, with cluster-level female employment rates serving as the instrument. Results across all models showed no conclusive evidence of a statistical association between maternal employment and undernutrition outcomes. However, the IV-point estimate suggests a 4–5 percentage point higher probability of child overweight, but the confidence interval still includes zero. In contrast, structural factors emerged as stronger predictors of child health. Each additional year of maternal education was linked to a 1.3 percentage point reduction in stunting and a 0.8-point reduction in underweight. Children from wealthier households were also significantly less likely to be malnourished, while regional disparities indicate heightened nutritional risks in provinces like Sindh and Balochistan. These findings suggest that maternal employment alone may not be a major driver of child nutrition in Pakistan; rather, policies aiming to improve nutrition should focus on addressing structural inequalities and enhancing caregiving environments. This study provides new empirical evidence to inform future research and policy in Pakistan's evolving labor and health landscape.

Keywords: *Maternal Employment, Instrumental Variables, Propensity Score Matching, Causal inference, Regional Disparities.*

ACCOUNTING FOR GROWTH: A COMPARATIVE ANALYSIS OF KAZAKHSTAN, KYRGYZSTAN, TAJIKISTAN AND UZBEKISTAN

FAWAD AHMADI

This study explores the sources of economic growth and structural transformation within sectors of agriculture, industry and services in four Central Asian countries (Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan) from 2000-2022. The paper uses a growth accounting method based on the Cobb-Douglas Production Function, in which the analysis breaks down the GDP growth into contributions from labor, capital and total factor productivity (TFP). Furthermore, the study performs a sectoral analysis by examining the value added and employment shares in agriculture, industry, and services to reveal the patterns of structural change within sectors. The main findings reveal that the contribution of capital accumulation was very significant in the early 2000 decade while the share of TFP has gradually increased by the later of the decade, especially in Kyrgyzstan and Tajikistan. The diversification of labor out of agriculture into sectors with greater productivity, and notably services, was essential in improving output per worker. Overall, the paper concludes that in the future economies of Central Asia are going to depend mostly on productivity-enhancing reforms, human capital investment, and resource redistribution rather than on an increase in physical capital investment.

THE IMPACT OF SOCIAL ASSISTANCE ON POVERTY ALLEVIATION: EXPLORING ITS ROLE IN STRENGTHENING SOCIAL PROTECTION IN CENTRAL ASIA

MAJID MARODBEKOV

This study investigates the effect of social assistance on poverty reduction in Central Asian Countries—Kazakhstan, Kyrgyz Republic, Tajikistan, and Uzbekistan—from 2000 to 2024. Using a country-level random effect panel regression model, the analysis examines the connection between social assistance expenditure on poverty rates, while controlling key economic and social variables such as: GDP per capita, income inequality (Gini index), unemployment, and the literacy rate. The result show that increases in social assistance spending are associated with a small but statistically significant drop in poverty, with a greater impact detected in models that account for country specific characteristics. Uzbekistan and Kazakhstan display more adequate conclusion because of wider coverage and administrative effectiveness, whereas Tajikistan and Kyrgyz Republic show narrow impacts due to targeting ineffectiveness and limited funding. These consequences suggest that well-designed and appropriately funded social assistance projects can contribute to poverty mitigation, however obstacles such as institutional and structural factors influence the effectiveness of the programs. In future research integration of interaction effects, governance indicators and more disaggregated data should be used.

Keywords: *Central Asia, social assistance, poverty reduction, inequality, panel regression.*

DETERMINANTS OF WOMEN'S ECONOMIC PARTICIPATION IN RURAL TAJIKISTAN: EVIDENCE FROM THE KHATLON REGION THROUGH THE LENS OF SDGS 4, 5, AND 8

MAVLUDA MARAMBEKOVA

This study examines the persistent underrepresentation of women in Tajikistan's labor market, with a particular focus on the Khatlon region—an area where entrenched social norms and structural barriers continue to restrict women's economic power and independence. The objective is to assess how gender attitudes, decision-making power, educational expectations, and lack of time due to too many responsibilities interact to shape women's participation in economic activities. Drawing on microdata from the 2023 Tajikistan Evaluation and Analysis Activity (TEAA) Survey, the analysis focuses on a representative sample of 1,579 women aged 18–54 across twelve districts in Khatlon. A logistic regression model was employed to estimate the effect of key predictors on women's labor force participation over the past 12 months. The results show that decision-making power has a positive and statistically significant effect: a one-point increase in the index corresponds to a 3.2 percentage point rise in the likelihood of being economically active. Conversely, women who reported feeling overwhelmed by unpaid duties were 9 percentage points less likely to work for pay. Surprisingly, women with higher education were 13 percentage points less likely to participate in the labor market, suggesting mismatches between qualifications and labor market opportunities, or sociocultural constraints on formal employment. These findings highlight the importance of understanding women's economic decisions as embedded within broader institutional and social contexts. By integrating SDGs 4, 5, and 8 into a unified analytical framework, this study contributes timely evidence to inform gender equity and labor policy in Tajikistan.

Keywords: *Women's Economic Empowerment, Gender Attitudes, Decision-Making Power, Time-Constraint, Educational Expectations, SDG 4, SDG 5, SDG 8, Khatlon Region.*

EVALUATING TAJIKISTAN'S EXPORT PATTERNS WITH CHINA AND CENTRAL ASIAN COUNTRIES: A GRAVITY MODEL APPROACH

MIZHGONA GULOMALIEVA

This study aims to examine the factors that affect Tajikistan's exports to its key trading partners, especially China, and the neighbouring Central Asian countries. The goal is to identify which key economic, geographic and institutional factors influence bilateral export movements. The analysis uses cross-sectional data gathered in 2017 to analyse the trade between Tajikistan and 178 partner countries. The data for the analysis were extracted from UN Comtrade, CEPII, World Bank, and USITC. A log-linear gravity model was estimated using Ordinary Least Squares (OLS), with the natural logarithm of GDP, population and distance. The analysis includes dummy variables to quantify the effects of trade agreements, being landlocked, and belonging to international institutions. According to the analysis, a 1% increase in the GDP of Tajikistan is associated with a 0.70% increase in the exports, while a 1% increase in distance results in a 0.89% decline in the trade. Trade is greatly boosted by higher GDP levels in the importing country and the existence of free trade agreements. Countries that are landlocked and the islands usually have a low level of trade. These findings suggest that the economic scale and trade facilitation initiatives are both essential for promoting Tajikistan's exports. The findings are useful for policymakers in the quest to break down trade barriers and promote regional integration.

Keywords: *Central Asia, Gravity Model, exports, regional trade, bilateral trade.*

THE ECONOMIC IMPACT OF VISA OPENNESS ON TOURISM IN CENTRAL ASIA

OZODABEGIM SHOHZODAEVA

Visa liberalization is widely regarded as a catalyst for tourism development, yet its economic impact remains underexplored in the context of Central Asia. Employing data from Passport Index and UN World Tourism Organization, this thesis investigates how visa openness, measured by the Passport Index Welcoming Score, influences tourism across five Central-Asian states and 118 comparison countries from 2015 to 2022. The cross-country panel data is analysed with pooled OLS and country fixed effects methods. The analysis reveals that a one-point increase in the Welcoming Score (representing about 10 extra visa-free passports) is associated with a 3.7% rise in international arrivals, while the implied elasticity for Central-Asian destinations is about 1.4 × larger. However, the influence on tourism expenditure is less consistent, indicating that attracting more tourists does not automatically translate to higher spending. These findings suggest that while visa liberalization positively affects tourism demand, its economic benefits vary based on regional context and supporting infrastructure. This study contributes to the tourism literature by providing quantitative evidence of the nuanced impact of visa openness in a geopolitically complex region, emphasizing the need for complementary policy measures alongside visa reforms.

Keywords: *visa openness; Central Asia; tourism arrivals; economic growth; e-visa; visa-on-arrival; tourism expenditure; panel data; fixed effects; regional integration; travel policy reform.*

THE IMPACT OF MICROCREDITS ON ENTERPRISE DEVELOPMENT IN KYRGYZSTAN

SAMAD IQBOLSHOEV

Access to credit remains a major constraint for small-scale entrepreneurs in developing countries, and there is limited evidence on whether microloans translate into sustained income growth for business owners. This study examines whether receiving microloans leads to increases in business-related income among individuals in Kyrgyzstan. Using panel data from the nationally representative Life in Kyrgyzstan (LiK) Study, the analysis draws on a sample of 243 individuals (with 11 microloan recipients) tracked from 2013 to 2016 and 2013 to 2019. Multiple linear regression models are applied to assess the short- and long-term effects of microcredit access, controlling for demographic, economic, and behavioural variables. The results show no statistically significant relationship between microloan receipt and business income growth in either timeframe; in fact, loan receipt is associated with negative (though statistically insignificant) coefficients. Education had a marginally positive effect in the short term, while sectoral affiliation and risk tolerance showed weak effects in the long term. These findings suggest that in contexts like Kyrgyzstan, microfinance alone is insufficient to foster sustainable enterprise growth, reinforcing the need for complementary interventions such as training, market linkages, and institutional support.

Keywords: *Microfinance, microloans, Kyrgyzstan, business income growth, entrepreneurship, regression analysis, Life in Kyrgyzstan dataset.*

THE LABOR MARKET IMPACT OF VOCATIONAL AND CONTINUING EDUCATION: INSIGHTS FROM CENTRAL ASIA

SUDOBA AZIMSHOEVA

This study explores the labor market and personal development outcomes associated with participating in the vocational and continuing education programs offered by the School of Professional and Continuing Education (SPCE) across four Central Asian countries, including Tajikistan, Kyrgyzstan, Kazakhstan and Afghanistan. The study utilizes a post – training dataset of 2,159 SPCE alumni with the purpose of exploring associations between training participation and self-reported changes in the employment status, income levels, and perceived well-being of the SPCE's graduates. This analysis explores how these outcomes differ by gender, age, type of course as well as delivery mode. To provide estimates on these relationships, multinomial, ordered logistic regression and binary logistic regression models are employed. Results show that participants in offline language courses were 62% more likely to report improvements in their well-being, whereas those who took advanced online IT courses were over 12 times more likely to report positive changes in their income. Older participants were slightly less likely to report welfare gains (3% lower per year of age), and alumni from Tajikistan had 20% higher odds of reporting improvements in employment. These findings suggest that some SPCE training formats, predominantly online IT courses and language courses, are linked to stronger labor market outcomes. Despite positive associations found between some types of SPCE training and improved reports, all results are based on cross sectional self-reported data and should be used without causal assumptions.

Keywords: *vocational education, human capital, logistic regression, Central Asia, School of Professional and Continuing Education (SPCE).*

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