EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

# COST Innovators Grant (CIG) Application Form

November 2023

**COST Association AISBL**
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Funded by
the European Union

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| **Application title** | **VisionXAI: Pioneering Visual Analytics for Establishing XAI Standards in European Finance with a Policy-Focused Impact** |
| **Application acronym** | **VisionXAI** |
| **Code of COST Action from which the CIG application originates** | CA19130 |
| **Submitter (must be Action Chair/ Vice Chair)** | Joerg Osterrieder, joerg.osterrieder@utwente.nl |
| **Origin of CIG application in the Action** | Since its inception in September 2020, the COST Action CA19130 focusing on transparency in European finance has rapidly become one of the most active, with over 34 official meetings and a network exceeding 380 working group members. With 40 COST countries participating, a dissemination platform with more than 3500 members and activities exceeding 6000 participants, this COST Action has had a substantial impact on the theoretical and practical foundations of explainable Artificial Intelligence. As an example for the outreach activities, we mention a two-day policy workshop on the premises of COST, with senior speakers from the European Commission and Parliament.<br>Over the past three years, the Action has laid a robust theoretical foundation in Artificial Intelligence, particularly in explainable AI, evidenced by over 6000 annual citations of its academic papers. Through extensive outreach, it has made vital connections with industry leaders, regulators, and other stakeholders.<br>During those interactions, it became evident that a visual analytics tool for showing the explainability of Artificial Intelligence computations is needed both to satisfy the requirements of the European regulators (among them the ECB, EBA, ESMA, EIOPA, European Data Protection Board EDPB, SSM, European Systemic Risk Board ESRB), answering to pressing needs of the industry as well as the end-users of the products.<br>Therefore, VisionXAI represents a strategic evolution of the COST CA19130 Action's objectives, transforming theoretical AI research into a tangible visual analytics tool that adheres to EU regulatory standards. The project's aim to develop a visual analytics tool for explainable AI in the financial sector directly addresses the need for greater transparency and policy alignment in FinTech. It encapsulates the Action's commitment to bridging academia and industry, fostering innovation, and driving strategic development in the financial technology domain. VisionXAI is not just a product but a proof of CA19130's interdisciplinary approach, setting a new standard for products leveraging Artificial Intelligence in alignment with European financial policies and regulations. |
| **CIG Grant Holder** | Bern Business School, Christian Hopp, christian.hopp@bfh.ch |
| **Summary (for publication if the application is approved)** | It is advised that the Action Grant Holder continues. If this is not possible, the new Grant Holder institution shall be the affiliation of one of the CIG Team members.<br>Our CIG project centres on the development of VisionXAI, a visual analytics tool designed for the European financial sector to make Artificial Intelligence (AI) more transparent and understandable. In today's financial landscape, AI plays a pivotal role in decision-making processes. However, the complex nature of AI systems often makes their decisions opaque, leading to a lack of trust among users, including financial analysts, regulators, and the general public. This gap in understanding and trust poses a significant challenge, especially considering the stringent regulatory environment of the European Union.<br>VisionXAI aims to bridge this gap by providing clear, visual interpretations of AI decisions, thereby demystifying complex AI models and making them more accessible and accountable. The tool is specifically tailored to meet the diverse needs of various stakeholders |

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| | in the financial sector. Whether it's a regulator requiring compliance with financial policies, a financial analyst seeking deeper insights, or an end-user needing clarity on AI-driven decisions, VisionXAI delivers audience-specific outputs to cater to these varied explainability requirements.<br>A key feature of VisionXAI is its emphasis on policy implications. The tool is designed to ensure that the AI-driven insights it provides align with European financial policies and regulations, aiding in compliance and informed decision-making. Moreover, VisionXAI addresses explainability comprehensively by considering it at every stage of the AI model development, including the data collection phase. This approach helps in identifying and mitigating potential biases in the underlying data, promoting fairness and integrity in AI-driven financial decisions.<br>The expected outcome of the VisionXAI project is multi-fold. Primarily, it will be a business plan for a visual analytics tool for explainable AI (XAI). The tool aims to set a standard for explainable AI in the European financial sector, enhancing transparency and trust in AI applications. This is crucial for reducing biases in AI-driven financial decisions and aligning these decisions with regulatory standards. The broader adoption and standardisation of VisionXAI across European financial institutions and regulatory bodies are anticipated, establishing it as an essential component of the AI systems used in finance. This not only enhances transparency and compliance but also improves the overall decision-making process in finance. |

| **Name and email** | **Institution** | **Country of affiliation** | **Role in the CIG** | **Relevant expertise and expected contribution in the CIG** |
|---|---|---|---|---|
| Jörg Osterrieder, joerg.osterrieder@utwente.nl | University of Twente | NL | CIG Chair | Action Chair CA19130<br>Coordinator MSCA Doctoral Network DIGITAL<br>Coordination, Organise Meeting 1 and 3 (M1, M3)<br>Stakeholder Relationships (lead WP2) |
| Branka Hadji Misheva, heb1@bfh.ch | Bern Business School | CH | CIG Vice-Chair | Lead of large industry-academia projects<br>Scientific Grant Holder CA19130<br>Research lead XAI, organize meetings WG1, WG4<br>Design the concept for the prototype |
| Christian Hopp, christian.hopp@bfh.ch | Bern Business School | CH | CIG Team | Top 10 researcher in Switzerland, academic output<br>Leads two SNF projects (around 1 Mio. CHF)<br>Contribute AI expertise<br>Develop XAI business case |
| Armela Baka, armela.maxhelaku@fdut.edu.al | University of Tirana | AL | CIG Team | Pursuing PhD in digital assets and property law<br>Consultant role: EU, GIZ, UNDP, UNIDO<br>Contribute to the business plan development<br>Create regulatory use cases |
| Suela Maxhelaku, suela.maxhelaku@fshn.edu.al | University of Tirana | AL | CIG Team | Lecturer and researcher: data science, AI, ML<br>Coordinated national and international projects<br>Ensure the IP compliance of the AI tool<br>Engage with EU regulatory bodies |
| Rezarta Perri, rezartaperri@feut.edu.al | University of Tirana | AL | CIG Team | Expertise in financial analysis and use of financial information in company/ business evaluation<br>Contribute AI expertise to XAI development |

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| | | | | Contribute to the XAI VA development |
| Stoyan Mishev, stoyan.mishev@vfu.bg | Varna Free University | BG | CIG Team | Four years teaching university courses in ML<br>Authored papers at the frontier of ML and physics<br>Develop XAI business case (for industry)<br>Apply EU data insights |
| Catarina Silva, catarina@dei.uc.pt | University of Coimbra | PT | CIG Team | Member of the Center for Responsible AI<br>COST STSM co-coordinator<br>Engage EU regulatory bodies<br>Develop XAI business case (for regulators) |
| Loizos Michael, loizos@ouc.ac.cy | Open University of Cyprus | CY | CIG Team | Collaborated with a bank on prototype AI system<br>Development for compliance testing of new clients<br>Develop XAI business case (for AI developers)<br>Ensure regulatory compliance of XAI VA |
| Roman Matkvovskyy, r.matkovskyy@rennes-sb.com | Rennes School of Business | FR | CIG Team | Founder and co-director of a research center<br>Leads a research group<br>Organize mid-term meeting. M2<br>Help in the design of user-specific visual analytics |
| Galena Pisoni, galena.pisoni@gmail.com | Université Côte d'Azur | FR | CIG Team | 10 years of experience in academia<br>Expertise in data analytics, AI for Finance, XAI<br>Contribute to the deployment of XAI methods<br>Organize final meeting (M3) |
| Bálint Molnár, molnarba@inf.elte.hu | Eötvös Loránd University | HU | CIG Team | Informations Systems, Business Processes<br>Application of Data Science, AI, Blockchain, NLP<br>Develop bias detection and mitigation methods<br>Track tech milestones. Co-organize meeting. M2 |
| Hanna Kristin Skaftadottir, hks7@hi.is | University of Iceland | IS | CIG Team | 15 years of industry experience<br>Board member: IS Blockchain Fdt., CARLab, NSG<br>Contribute AI expertise<br>Engage EU regulatory bodies (co-lead WG2) |
| Jamal Nasir, jamal.nasir@universityofgalway.ie | University of Galway | IE | CIG Team | Partner in a €4.8 million project, investigator for SFI<br>COST Actions CA19130 and CA21131<br>Lead data collection for the business case (WG1)<br>Define market strategy |
| Cal Muckley, cal.muckley@ucd.ie | University College Dublin | IE | CIG Team | Experience in AI, ML, Ethics, Financial services<br>Recent papers on AI and financial services<br>Responsible for organizing the pilot test of the XAI VA with different stakeholders. (WG3 lead) |
| Maria Iannario, maria.iannario@unina.it | Unversity of Naple Federico II | IT | CIG Team | Chair of datathon contests<br>COST Action CA19130, MSCA DN Digital Finance<br>Co-lead on XAI research (WG1)<br>Lead for AI/UIX issues of XAI VA tool |
| Sabrina Giordano, sabrina.giordano@unical.it | University of Calabria | IT | CIG Team | Created algorithms for fair decision support<br>Research on data-driven algorithms<br>Contribute AI expertise<br>Evaluate XAI user feedback (WG3) |
| Alessandra Tanda, alessandra.tanda@unipv.it | University of Pavia | IT | CIG Team | Conducted research in the area of XAI for finance<br>COST Action CA19130, FINTECH HO2020, IRM<br>Define market strategy<br>Implement business plan |

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| Claudia Tarantola, claudia.tarantola@unipv.it | University of Pavia | IT | CIG Team | Member of the Italian managing committee for COST Action CA19130, associated editor for JASA<br>Engage EU regulatory bodies<br>Develop XAI business case, organize M3 |
| Albulena Shala, albulena.shala@uni-pr.edu | University of Prishtina | XK | CIG Team | Banking and finance background<br>10 years university experience<br>Contribute AI expertise<br>Create regulatory use cases, contribute to WG2 |
| Vlora Berisha Dranqolli, vlora.berisha@unhz.eu | University of Peja-Haxhi Zeka | XK | CIG Team | FinTech and societal issues<br>Multidisciplinary researcher<br>Engage EU regulatory bodies<br>Develop novel bias detection approaches |
| Ramona Rupeika-Apoga, rr@edu.lu.lv | University of Latvia | LV | CIG Team | Cryptocurrency & fintech research<br>Digital transformation understanding<br>Conduct financial study. Organize mid-term meeting. M2<br>Engage EU regulatory bodies |
| Audrius Kabašinskas, audrius.kabasinskas@ktu.lt | Kaunas Uni of Technology | LT | CIG Team | Financial mathematics expert (15+ years)<br>XAI researcher, coordinator of CA19130<br>Lead of the user engagement feedback (WG2)<br>Engage EU regulatory bodies |
| Eftim Zdravevski, eftim@finki.ukim.mk | Ssh. Cyril and Methodius University | MK | CIG Team | Founder of Magix.AI with 120+ publications<br>17+ years in research & software development<br>Develop XAI business case<br>Innovate XAI feature set |
| Petre Lameski, petre.lameski@finki.ukim.mk | Ssh. Cyril and Methodius University | MK | CIG Team | WG2 leader CA19130, AI & ML expert<br>17+ years of academic & industry experience<br>Track technological milestones.<br>Contribute AI expertise |
| Anastas Dzurovski, anastas.dzurovski@uklo.edu.mk | University St.Kliment Ohridski Bitola | MK | CIG Team | Financial and banking regulation<br>AI regulation<br>Analyze market trends<br>Lead the application process for V1 |
| Olivija Filipovska, olivijaf@gmail.com | Komercijalna Banka | MK | CIG Team | Finance research projects<br>Corporate role and background<br>Co-organize mid-term meeting. M2<br>Develop XAI business case |
| Karolina Bolesta, kbolesta96@gmail.com | Warsaw School of Economics | PL | CIG Team | AI model building & validation<br>Model transparency & insights<br>Ensure AI tool IP compliance. Organize M1.<br>Develop XAI business case |
| Piotr Wójcik, pwojcik@wne.uw.edu.pl | Warsaw School of Economics | PL | CIG Team | Research in XAI tools in finance and economics<br>Understanding algorithms for trust in AI<br>Contribute AI expertise. Organize mid-term meeting. M2<br>Develop XAI business case |
| Będowska-Sójka, bedowska@ue.poznan.pl | Poznan University of Business | PL | CIG Team | Financial modelling, data analysis<br>Green finance, machine learning<br>Develop XAI business case. Organize M1.<br>Evaluate XAI user impact |

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| Susana Aires de Sousa, susanaas@fd.uc.pt | University of Coimbra | PT | CIG Team | Law and regulation expert<br>AI responsibility focus<br>Analyze market trends<br>Develop XAI business case |
| Joana Dias, joana@fe.uc.pt | University of Coimbra | PT | CIG Team | Operations research and quantitative finance<br>Expert in explainable AI for finance<br>Emphasize model transparency<br>Develop XAI business case |
| Ioana Coita, coita.iflorina@gmail.com | University of Oradea | RO | CIG Team | Quantitative & behavioural finance expert<br>Tax research & consultancy specialist<br>Contribute AI expertise<br>Develop XAI business case |
| Codruta Mare, codruta.mare@econ.ubbcluj.ro | Babes-Bolyai University | RO | CIG Team | Econometrics, Data Analysis, Visualization<br>NLP, AI, FinTech, Ethics in AI<br>Navigate EU AI regulations<br>Engage EU regulatory bodies |
| Liana Stanca, liana.stanca@econ.ubbcluj.ro | Babes-Bolyai University | RO | CIG Team | AI and Data Science specialist<br>Extensive experience in NLP<br>Develop XAI business case<br>Ensure AI tool IP compliance |
| Stefana Belbe, stefanacioban@yahoo.com | Babes-Bolyai University | RO | CIG Team | Data Science Consultant, cloud analysis<br>PhD in Cybernetics and Statistics<br>Co-lead the application process for V1<br>Engage EU regulatory bodies |
| Jana Peliova, jana.peliova@euba.sk | University of Economics in Bratislava | SK | CIG Team | Behavioral science in finance<br>Fintech and Insuretech expertise<br>Design visual analytics tool for regulators<br>Process user feedback. Lead the application process for V1 |
| Luis Vicente, lavicent@unizar.es | University of Zaragoza | ES | CIG Team | Portfolio Mgmt & Behavioural Finance<br>Performance Evaluation & AI Decisions<br>Conduct financial study<br>Navigate EU AI regulations. Co-lead the application process for V2 |
| Peter Schwendner, scwp@zhaw.ch | ZHAW | CH | CIG Team | Financial industry experience<br>Published papers on Explainable AI<br>Develop XAI business case<br>Conduct financial study |
| Nadi Serhan Aydin, serhan.aydin@istinye.edu.tr | Istinye University | TR | CIG Team | Quant. Finance, Math. Optimization, ML, Risk Mgmt<br>Holds an FRM certificate by GARP<br>Apply EU data insights<br>Co-lead the application process for V3 |
| Gizay Daver, gizaydaver@gmail.com | Zonguldak Bulent Ecevit University | TR | CIG Team | Banking and finance expert<br>Developing AI model for banking<br>Contribute AI expertise<br>Develop XAI business case |
| Mutlu Akar, makar@yildiz.edu.tr | Yildiz Technical University | TR | CIG Team | AI, ML, Data Science modelling, Data Analysis<br>Authored articles on predicting outcomes using AI<br>Pilot test for feedback<br>Process user feedback |

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| Bekir Çetintav, bekircetintav@mehmetakif.edu.tr | Burdur Mehmet Akif Ersoy University | TR | CIG Team | Manages more than 10 industrial projects<br>Experience in real-world fintech applications<br>Plan XAI business strategy<br>Develop XAI business case |
| Enis Kayış, enis.kayis@ozyegin.edu.tr | Ozyegin University | TR | CIG Team | Expertise in XAI Optimization<br>10+ years in human-centric AI<br>Innovate XAI feature set<br>Plan XAI business strategy |
| Gokce Nur Yilmaz, nur.gkc@gmail.com | TED University | TR | CIG Team | AI and ML research for 5+ years<br>Data Science and Analysis: 15+ years experience<br>Optimize technology and UX<br>Innovate XAI feature set |
| Haluk Citci, halukcitci@gmail.com | Gebze Technical University | TR | CIG Team | 15+ years of expertise in finance<br>COST Actions 19130 and 22101<br>Complete XAI tool development<br>Track tech milestones |
| Ania Zalewska, a.zalewska@le.ac.uk | University of Leicester | GB | CIG Team | Co-founder of the Finance Research Consortium<br>Director of CFGE, COST Action 19130<br>Engage EU regulatory bodies<br>Apply EU data insights. Co-Organize M2. |
| Lu Liu, l.liu@leicester.ac.uk | University of Leicester | GB | CIG Team | AI & FinTech expert, real-time anomaly detection<br>Leading AI for financial risk & health projects<br>Develop XAI business case<br>Plan XAI business strategy. Co-organize M3. |
| Esra Kabaklarlı, etalasli@selcuk.edu.tr | Selcuk University | TR | CIG Team | Expertise in economics, econometrics, finance<br>Developing XAI policy tools for finance<br>Plan XAI business strategy<br>Evaluate XAI user impact. Co-organize M3. |

The CIG team members agree to commit to their contribution as described above and in Part B - Implementation.

## 1. INNOVATION POTENTIAL

### 1.1 WHAT IS THE PRACTICAL CHALLENGE AND TARGET GROUP THAT YOU WILL ADDRESS

Artificial intelligence (AI) is revolutionising technology-driven fields, offering significant innovation opportunities in finance (Dingli et al., 2017, Di Persio et al. 2017, Sen et al., 2021, Yang, 2021, Shi et al., 2022). Yet, its widespread adoption hinges on trust in its outputs (Doshi-Velez and Kim, 2017, Miller, 2018, Moscatelli et al., 2019, Cascarino et al., 2022, Madabu et al., 2022). Despite the growing popularity of the topic, a key gap in explainable AI within the finance sector is the lack of methodologies for interpreting complex, high-dimensional financial models in a way that is both accessible to non-experts (Hadji Misheva, 2021 and Weber, 2023) and compliant with evolving regulatory standards, presenting a prime opportunity for an innovative project aimed at bridging this divide. Building on the identified gap, **the project will focus on creating a visual analytics (VA) tool that not only demystifies complex financial models for non-experts but also adheres to European regulatory requirements, setting a new standard for explainable AI, providing a clear, interactive, and user-friendly interface to understand AI-driven financial insights.**

The gap in explainable AI (XAI) in finance can be attributed to a variety of practical challenges. A primary issue is the suitability of existing XAI methods for the diverse stakeholders within the financial value chain, including model developers, risk experts, model auditors, and end-users. Each group requires different levels of explainability and forms of visualisations that can convey complex AI-driven insights in a comprehensible and actionable manner (Holstein et al., 2019, Bhatt et al., 2020 and Hadji Misheva et al. 2021). The challenge is to create visual tools that can cater to these varied requirements, with accessible explanations, relevant to all stakeholders. Furthermore, there is a mismatch between theoretical XAI approaches and the practical needs of the industry. Theoretical models fail to address the specific, real-world complexities of financial applications (i.e. scalability issues (Bertossi et al., 2021) or feature dependence issues (Molnar, 2019 and Kumar, 2020)). Bias, fairness and data integrity in ML models also pose significant hurdles (Grupa et al. 2021). Although numerous bias detection and mitigation techniques are available in the literature (Prakhar et al., 2023), there is a gap targeting financial data, with its high-dimensional input spaces (Ali et al., 2023). Aligning AI systems in finance with European AI regulations, such as the GDPR, EBA guidelines, ECB standards, and the proposed EU AI Act, adds another layer of complexity.

Target audience:

- **European Financial Institutions** such as banks, investment, and insurance companies. The research team has established connections with Deloitte, Swedbank, Raiffeisen Bank, Vontobel, ING, all of which have confirmed their interest with us and are increasingly integrating AI within the stringent EU regulatory framework. With the solution, they can access comprehensive documentation and examples on the end-to-end process of training ML and deep learning (DL) models on risk management use cases. They will also access novel context-specific bias mitigation and explainability methods.
- **European Regulatory Bodies**, like the ECB (Department on Risk Management and Supervision team on AI methodologies), ESMA, the BIS (Department on Risk Methodologies, Department of IT), all of which need tools to effectively evaluate and monitor AI applications in finance. With the CIG solution, these agents will have a better understanding on how complex models are built and what type of processes are in place to ensure fairness and explainability standards.
- **AI Developers and Data Scientists**, who are required to align AI models with EU financial regulations and standards, will benefit from the CIG visual analytics solution as it will provide them with a functional AI playground and detailed access to code, scripts and data to replicate novel methods and visualisations developed by the consortium.
- **Policy Makers and Legislators**, like the European Commision and the team leading the AI Act involved in formulating and refining AI regulation in the financial sector, will benefit as it will help them further specify regulation on explainability requirements for different audiences.
- **End-Users in the EU Finance Sector at large** (like the European Consumers Union (ECU)), who require transparent and understandable AI tools for decision-making. The solution's user-friendly interface and comprehensive documentation provide valuable insights into how AI decisions are made and the potential biases involved, fostering greater awareness and informed dialogue about AI use in society.

### 1.2 WHAT IS YOUR PROPOSED SOLUTION AND THE MAIN OUTCOMES OF THE CIG

The proposed solution is the development of a visual analytics tool for explainable AI, specifically tailored to the needs of the European financial sector. The features of the VA tool are outlined below:

- **User-specific interpretations and visualizations.** The VA will: (i) customizes explanations and visualizations to meet the specific explainability needs of various user groups, (ii) provide an overall score indicating the degree to which the AI model aligns with expert financial reasoning

and (iii) offer insights into the key features driving the model's outputs.

- **Data & algorithmic bias score.** The VA will also incorporate a quantitative measure to assess the level of bias within the dataset or algorithm and helps users understand and address potential skewness in data or decision-making processes.
- **Regulatory compliance score**. The VA will help users evaluate how well the data, model, and interpretations adhere to current financial regulations.

In addition, the tool will also allow users to drill down to any level of detail concerning the deployment of the tool and all documentation related with the data used, code developed, and novel analytical and visualisation tools proposed.

In terms of main outcomes, the VA tool will serve as a cornerstone in establishing a **XAI standard in the European financial sector**, enhancing policy compliance and alignment with European financial regulations. It will **significantly improve the transparency and trustworthiness of AI applications in finance**, effectively reducing biases in AI-driven financial decisions. Additionally, this tool will contribute valuable insights to XAI research, particularly in visual analytics, and will be supported by a **comprehensive business plan detailing strategies for implementation, market penetration, and growth in the financial sector**. The primary endpoint of the project is to achieve **broad adoption and standardisation of explainability practices across European financial institutions and regulatory bodies**, establishing it as a standard practice within the industry.

**1.3 OBJECTIVES OF THE CIG**

**Primary objective 1:** The main goal of this project is the development of a **SaaS-based visual analytics tool, accessible in a Cloud Computing environment, specifically designed for explainable AI in the European finance sector that will be compliant with evolving European regulatory standards, and accessible to audiences of different explainability requirements and levels of technical knowledge, together with an appropriate business plan**. The specificity of the project lies in its targeted design for financial AI applications, addressing a clear market need. In terms of measurability, the goal is to complete the development of this tool and begin user testing within 6 months, setting a clear timeline for progress assessment. The project is achievable as it builds upon existing XAI frameworks, adapting and integrating new features tailored to the intricacies of financial data. Its relevance is underscored by the increasing demand for transparency in AI decision-making processes within the stringent regulatory environment of EU finance. The topic is timely, aiming to deliver a complete, market-ready version of the tool within 12 months. The outcomes are aligned with the European Union's strategies on Digital Finance and AI.

**Secondary objective 1:** To map out and match various XAI methods with the diverse explainability needs in the European finance sector, highlighting the gaps between theoretical interpretability and practical requirements. The aim is to create more intuitive and user-friendly visualisations that can convey complex AI decisions effectively.

**Secondary objective 2:** To identify and address any deployment issues associated with the identified XAI methods. The CIG will aim to integrate XAI methods that are easily scalable and valid even under the assumption of correlated input features.

**Secondary objective 3:** To identify and incorporate all European financial policies and regulations that impact AI deployment in the finance sector.

**Secondary objective 4:** To define a framework for robust bias detection and mitigation applicable to high-dimensional, correlated financial data.

**Secondary objective 5:** To operationalize the VA tool, i.e. build a SaaS-based solution that offers intuitive, customizable visualization tools for varied expertise levels, ensures regulatory compliance, provides plain-language interpretability reports, and ensures data security, all while being scalable and user-friendly with robust support and training resources.

**Primary objective 2:** To develop a comprehensive business plan outlining the strategy for implementing, scaling, and commercialising the visual analytics tool within the finance sector. This plan encompasses market analysis, deployment strategies, potential revenue models, and sustainability measures, ensuring the tool's long-term impact and viability in the financial industry.

**1.4 WHAT IS INNOVATIVE ABOUT YOUR SOLUTION**

The innovative tool for XAI in finance stands out due to its comprehensive features and compliance-focused design, which are not present in existing solutions:

1. **Business-Oriented Prototype**: Converts academic research to spark the development of successful business plans and products using XAI.
2. **User-Centric Explanations**: Tailors XAI methods to the specific needs of different user groups within the financial sector.
3. **Specialized Visual Analytics:** Features audience-dependent visual analytics that are scalable and maintain validity even with feature dependence.
4. **Data & Algorithmic Bias Score**: Provides users with a quantitative measure to assess and

articulate the bias within financial datasets and models.

5. **Regulatory Compliance**: Assures that data, models, and interpretations align with current regulations, satisfying the diverse explainability needs of financial stakeholders. The solution will be specifically crafted for the European financial market, ensuring adherence to GDPR, EBA guidelines, and the EU AI Act.
6. **High level report**: Enables non-technical audiences to have high-level conclusions concerning the degree to which the AI model aligns with expert financial reasoning and relevant regulations.
7. **Detailed Documentation**: Allows users comprehensive access to documentation regarding data usage, code development, and innovative analytical and visualization tools.

This tool significantly advances the field of XAI by integrating state-of-the-art techniques that effectively manage complex data and address bias, areas where existing methods often fall short.

**2. EXPECTED IMPACT**

**2.1 DESCRIBE WHO AND/ OR WHAT WILL BENEFIT, HOW, WHEN AND TO WHICH EXTENT**

The CIG will have a major impact in all of the nine primary scientific, economic/technological and societal Key-Impact Pathways of Europe, both in the short and long run. It will impactall larger European banks, Fintechs across the EU, government agencies (ECB, BIS) and the end-user. We have substantial preliminary interest specifically from the ECB and BIS on such a tool and will work with them over the next three years.

**A. Economic and technological Impact**

Short-Term Perspective (within 12 months):

- **Novel, audience-specific visualisations of explanations.** (BIS IT team, ECB AI team)
- **Scalable application deployment.** The CIG will integrate XAI methods that are scalable and can handle correlated input features (European Fintechs, Banks, e.g. ING).
- **Technical advancements**. The open-source nature of the toolkit will facilitate knowledge sharing and collaboration among researchers, developers, and practitioners, leading to the development of innovative XAI techniques.
- **Visual Analytics Framework**. The VA tool will enable different users to understand: the data pre-processing, the bias mitigation strategies, the feature selection process, and ultimately the training and testing of the AI-based system.

Long-Term Perspective (within 24 - 36 month): Sustained and Expansive Impacts in Finance

- **Setting New XAI Standards**: The guidelines and models developed for fairness, and explainability will likely become industry standards. Financial technology firms will adhere to these models, ensuring a consistent level of AI transparency across the sector.
- **Novel, domain-specific bias detection and mitigation techniques.** Defining a framework for bias detection and mitigation in AI-driven decisions is to ensure fairness and integrity. Financial data is influenced by a myriad of socio-economic factors that need to be unbiased.
- **Innovative Financial Tools**: We anticipate 15 new AI-driven financial tools and 10 sustainable digital finance tools within three by the end of the Action as well as five potential IPR applications for unique methodologies in AI and sustainable finance.
- **Investment Mobilization**: The CIG will draw several millions in PPIs within five years.
- **Cost Savings in Compliance and Risk Management**: Financial institutions spend a significant portion of their budget on compliance, estimated to be around 15-20% of their total operational costs. Implementing XAI can reduce these costs by improving the efficiency of compliance processes. For instance, if XAI reduces these costs by even 5%, for a bank with $1 billion in operational costs, this would mean savings of $50 million to $100 million.

**B. Societal Impact**

- **Enhanced trust and transparency in the financial sector**: The toolkit will facilitate informed decision-making among users, for a more trustworthy and transparent financial ecosystem.
- **Compliance with regulations**. The toolkit will provide clear guidance and tools for ensuring compliance with AI regulations, such as the EU AI Act.
- **Accountability and transparency in AI.** XAI will promote a culture of accountability and transparency in the use of AI, ensuring that AI systems are used responsibly and ethically.
- **Fairness and Bias Mitigation.** Higher transparency facilitated by XAI contributes to increased awareness of potential biases, reinforcing a commitment to fairness in AI applications.

**C. Scientific Impact**

- **Addressing EU Policy Priorities and Global Challenges through Research and Innovation:** By emphasising XAI and digital transformation, our Action directly aligns with Europe's strategic priorities to establish itself as a frontrunner in digital innovation while addressing environmental and ethical considerations (EU Digital Finance Package, EU Green Deal, European Approach to Artificial Intelligence).
- **Scientific output:** The CIG will produce several scientific papers on XAI and their implementation

in the industry. A target journal is e.g. The Journal of Financial Innovation.

These benefits will realise progressively with immediate impacts seen in the form of enhanced regulatory compliance and increased confidence in AI-driven financial tools. Long-term benefits will include more robust financial markets, informed regulatory frameworks, and a more AI-literate society.

**2.2 PLAN FOR EXPLOITATION**

Our network has **substantial connections with industry**, such as the Global Analytics and market risk teams at ING, the AI supervisory team at the European Central Bank, the IT team at BIS, the risk analytics teams at UBS and Deutsche Bank, and is well integrated into the **European academia-industry networks**, such as a European MSCA PhD and Research Programme on Digital Finance, the European Consortium on Mathematics for Industry, EIT Digital, and **European industry and consumer associations** such as several national Fintech and financial consumer association. Over the last year, a majority of them have expressed the need and desire for the prototype of a XAI tool we are proposing. Those companies and end-user representatives will be invited to the kick-off meeting, to collect early feedback and input as well as the two main follow-up meetings to ensure suitability for them. Besides large companies, we have been working with a few Fintech companies (in Germany, Switzerland, Italy) that have shown interest to commercially exploit a prototype.

**Dissemination of research results and the XAI tool**. Using the synergies of other European research consortia, the CIG members will organise their own large conference to showcase the technological advancements on the XAI tool, a policy event in Brussels for the regulatory results and requirements and the annual open science festival in Amsterdam to reach the end-user. We also use standard channels such as our website, LinkedIn, blog, and Twitter. Newspapers, social media, and public demonstrations will be utilised to reach the public (e.g., one lab day and several public talks). Members of CIG have organised **over 120 research and industry-focused conferences**, workshops, and roundtable sessions, which were attended by **over 6,000 individuals** from academia, industry, the regulatory community, and the general public (https://www.meetup.com/Fintech AI in Finance/ with **2000 participants**). We will use https://www.alphagalileo.org/en-gb/ to **disseminate significant findings to 5,000 journalists and potentially 2 million consumers**.

Through use case presentations at various industry-focused meetings, workshops, and roundtable sessions, as well as media releases, news articles, and blog posts published on our website, LinkedIn, and similar channels, the **industry community will be reached**.

**Exploitation of results**. The topics within this CIG are crucial for the European Finance industry to be able **to compete on a global scale within the next decade** hence the exploitation methods envisioned are:

**Further internal research**. Results will feed into subsequent research in the fields of ML for industry and computer science, also outside Finance.

**Collaborative research**. The results will help shape future collaborative research, such as via an Eureka application, a new COST Action and an EU H2020 Widening application, as agreed upon by all CIG members.

**Collaborative, industry-focused projects**. Our findings result in a **prototype and multiple use cases**. In the sequel, they will need to be refined and adapted to the industry's shifting requirements. Together with industry, CIG members will seek international funding for additional projects.

**Product development**. The CIG will result in o**ne proof-of-concept solution for the industry-specific requirements** for a domain-specific XAI tool. **These will be transformed into actual products by industry**, which necessitates ongoing cooperation.

**Education**. The output of research will **feed back into education, e.g. via the MSCA Doctoral network on Digital Finance and EIT Digital**.

**Standardisation**. The CIG research will produce a standardised framework for a XAI tool tailored to EU regulatory needs **based on the Data Hub of the EU Digital Finance Platform**.

**Exploitation across industries**. Due to the fundamental methods and techniques (ML, AI, RL) we employ, our outcomes will **not only benefit the Finance industry, but also a number of other industries**. A Policy paper will be beneficial to regulators (e.g. ECB). Over the past years, members of CIG have organised training and demonstrations for non-technical audiences (regulators, supervisors, and the general public, **including all 28 European regulatory authorities**) through EU-funded projects (https://fintech-ho2020.eu/). These contacts will be actively maintained.

**Barriers to exploitation and how we address them**. Barriers to exploitation exist: Inadequate financing to go from prototype to business product. Given the **substantial amount of VC funding** that goes into XAI, this is extremely unlikely. We will begin with a **minimum viable product** and then scale up. **All IP issues will be discussed well in advance of any new discoveries or commercializations**. Industry and academia **collaborate from day one**, and **all research is continuously validated by industry.**

| 3. PLAN FOR IMPLEMENTING THE CIG | | | | |
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| **3.1 WORK PLAN** | | | | |
| What will be done | Which COST Networking Tool(s) will be used | Expertise required | CIG Team Members committed to this activity | Budget required |
| **M1. Kick-Off Meeting, Strategic Plan and distribution of work**. Technical Roadmap, Concept of the XAI Tool, Stakeholder Engagement and Dissemination Strategy, Develop IP policy | Meeting, two days, Brussels, November 2024 | **Deep understanding of AI, Machine Learning, and Visual Analytics** to outline the technological foundation and developmental milestones. **IP knowledge for AI tools** for the industry with regulatory components. **Engagement with EU regulators, industry and the end-user Business**: Convert explainable AI tools in the form of a prototype and visual analytics platform to a **business case** | | 20k |
| **WG1. XAI Tool Development and Technological Innovation.** | WG Meeting, Berlin, January 2025 | **Design knowledge for visual analytics products** to finalize the design specifications for the XAI tool and identify key technological challenges | | 7k |
| **WG2. Policy Alignment and Regulatory Compliance.** | WG Meeting, Bern, February 2025 | **Understand the EU regulatory frameworks** relevant to AI tools (AI Act, GDPR, EU Digital Strategy), and develop strategies for compliance | | 7k |
| **WG3. User Engagement, Feedback, and Market Strategy.** | WG Meeting, Vienna, March 2025 | **Business and user knowledge for technical products** to define target markets, gather user feedback, and draft initial marketing strategies | | 7k |
| **M2. Mid-term Progress evaluation.** Allow end-users to test the prototype and collect feedback. | Meeting, two days, Strasbourg, May 2025 | **Data, Technology and end-user experience.** Use Case from the EU Data platform presented. Pilot test carried out (different users will interact with the tool and provide feedback on the utility of the available features and visualisation techniques). | | 20k |
| **WG4. XAI Tool Development and Technological Innovation** | WG Meeting, Kaunas, June 2025 | **Deep AI and UIX knowledge** to solve outstanding issues on algorithmic complexity, data integration challenges, and user interface design problems | | 7k |
| **WG5. Policy Alignment and Regulatory Compliance** | WG Meeting, Bucharest, July 2025 | Combined technical, regulatory and business to **define relevant regulatory use cases** | | 7k |
| **WG6. User Engagement, Feedback, and Market Strategy** | WG Meeting, Helsinki, August 2025 | **Market knowledge** to analyse the market research findings and market trends relevant to the XAI tool. **End-user knowledge** to analyze user feedback collected from two user testing sessions and one survey | | 7k |
| **M3. Final Meeting.** Delivery of Business plan. Presentation of prototype. Outreach to stakeholders, EU regulators, industry and citizens | Meeting, two days, Brussels, October 2025 | **Business knowledge** to finalise the business plan with market analysis, XAI Tool overview, marketing strategy, operational plan, financial projections, and risk assessment. Outline the implementation of the business plan. **Deep technical knowledge** to finalise the XAI Tool, its further development | | 20k |

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| | | process, technological innovation, features, and user benefits. | | |
| **VG1. Innovation Group.** | Virtual Grant | **Technical experts** to develop new, innovative features and improvements in the XAI Tool. | | 1.5k |
| **VG2. Impact Study. I** | Virtual Grant | **User experts and industry** to conduct a study to assess the impact of the XAI Tool on users. | | 1.5k |
| **VG3. Foundations for Business Plan.** | Virtual Grant | **Industry and business experts** to undertake a financial feasibility study to assess the financial viability of the project. | | 1.5k |
| **Subtotal** | | | | 106.5k |
| FSAC (15% of *Subtotal*) | | | | 15.975 |
| **Total** | | | | 122.475 |

**3.2 INTELLECTUAL PROPERTY RIGHTS CONSIDERATIONS**

The main goal of this CIG is to achieve **sustainable business success via the technological implementation of the research results** into a visual analytics tool for explainable Artificial Intelligence, that will be commercially exploited by industry and the CIG members as a foundation for future products. We estimate the likelihood of IP topics to arise during the CIG as very high. Therefore, an IP strategy is a must.

**In our case, specifically the unique algorithms and the user interfaces of our AI tool will need an appropriate IP protection, via patents for algorithms and trademarks for user interfaces.**

The CIG will follow the agreement of COST with the European Commission to implement the principles set out in the Code of Practice annexed to the Commission's Recommendation on IP management and will therefore develop an IP policy. Many of the CIG members are **well experienced with IP rules** and this consortium has, in various EU H2020 and Horizon Europe settings, already implemented several IP agreements, lastly as part of a new MSCA Industrial Doctoral Network on Digital Finance, following the HE IP regulations.

Our CIG network has agreed to **implement an IP strategy before the start of the CIG** and revise it as needed. Specifically:

**Before the start of the CIG:** All CIG members have existing IP regulations in place as part of their long-term strategy to exploit publicly-funded research results in line with European regulations. All partners will provide their pre-existing knowledge, which will undergo a detailed pre-audit. Each team member has agreed to undergo an IP knowledge and training course, offered by members of our CIG.

The CIG will develop the specifics of the IP policy, the dissemination and knowledge transfer strategy in a pre-meeting. The underlying principles have already been agreed to by all.

**During the Action:** We will work together with the European IPR Helpdesk to create the IP contract. The legal teams of each institution, well experienced in academia-industry IP regulations via many EU H2020 projects and industry spin-offs, will be available, should any issues arise. The IP regulations will define the access rights and the sharing of revenues, proportional to the contribution of each member, measured via the technological and time contributions.The Action will actively work towards one commercial spin-off from this project as well as at least two industrial collaborations with a clearly defined IP regulation. All partners have agreed to follow the following dispute management, in line with public procurement rules: Any dispute shall be submitted to mediation in accordance with the WIPO Mediation Rules. The place of mediation shall be Brussels (Belgium). If the dispute cannot be solved by the help of mediation, it shall be finally settled by the courts of Brussels. Should new technological results or opportunities for exploitation arise, IP considerations will be taken into account during the research. We will adapt to the project's evolving nature.

**After the Action:** The IP regulations will stay in place and the members will continue to actively exploit the research outcome to transfer them to economically viable products and business models Partners will continue to work together on those topics in various settings, such as further Horizon Europe projects. Using the EUREKA scheme, CIG members will work with industry to further exploit the results. IP Rights are fundamental for safeguarding the **innovative algorithms and user interfaces of our visual analytics tool** for the European Finance Industry and European Government Agencies, ensuring that the ideas, technologies, and methodologies developed are properly attributed, protected and **converted to successful economic products**.