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The Experience of Using AI in the Forensic Economics: A Scoping Review

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Abstract: Forensic economics is a relatively new branch on the intersection of the economics and forensics at least. The separate use of the artificial intelligence in law, forensic, and economics is known, therefore, the aim of the scoping review was to identify the ways the AI is applied in the intersection of several disciplines, called the forensic economics. To achieve the aim, the scoping review was conducted according to PRISMA extension guidelines. Out of 1406 articles, we selected 35 of the most relevant researches. Since the main function of the forensic economics lays in valuation and estimation, the selected works covered different aspects of AI-assisted patterns recognition, valuation and estimation, prediction, and decision making that can be used in economic researches in business, medicine, insurance, real estate, and law, for business and real estate valuation, tax and credit risks prediction, mortality prediction, prices and compensation values prediction. Regarding the exact types of the AI, this scoping review revealed that the most widely used and efficient AIs are neural networks and regression algorithms. Although, none of the 35 selected articles clearly stated the application of the developed AIs for the forensic economics, they can potentially make a significant contribution into forensic economics for solvency of business-related disputes, personal damage related disputes, insurance disputes, and even marital disputes, and valuation of the related costs and losses. The results of this scoping review can provide benefits and new insights for the practitioners in the field of the forensic economics, since the very field is complex and operates with a great number of methods from the many other scientific areas, not only from the economics. Therefore, the results of the this scoping review can become a starting point in understanding the ways to implement the AI technologies in the practice of the forensic economics.

Keywords: forensic economics, litigation, legal disputes, loss valuation, damage valuation, artificial intelligence, machine learning algorithms.

Introduction

Nowadays, it has finally and widely been recognized that the economics includes forensic subdiscipline. Surprisingly however, there is no universal agreement on what this subdiscipline exactly entails.

In the United States, forensic economics first sublimed into discrete field of expertise no sooner than in the 1970s when state courts started allowing testimony of the economists. Logically, in the 1980s, the National Association of Forensic Economics was established.

According to National Association of Forensic Economics, forensic economics is the scientific discipline that applies economic theories and methods to matters within a legal framework. In other words, forensic economics is a branch of economics that manipulates with economic theories and accounting principles in the legal field. From practical point of view, forensic economics investigates evidence of hidden behavior and evaluates economic losses related to specific unfortunate events in absolutely various industries.

However arguable among experts in forensic economics, but primarily role of this science is assessment of the damages in different legal disputes related to personal injury, wrongful death, breach of contract, or intellectual property infringement, that involves applying economic theories for calculation of lost wages, medical expenses, lost earning capacity, etc. (Broulik, 2019). Filed of forensic economics also encompasses business valuation to determine the value of a business or its assets; participation in investigation of the frauds contributing to analysis of the financial records, transactions, and other relevant data to trace and evaluate the extent of the fraud; economic and financial analysis of market trends, industry data, or economic model to support the party in antitrust, class actions, and labor disputes; participation in insurance disputes providing evaluation of the economic impact of an insurance claim, the value of a loss, or providing litigation support; and, finally, economic policy analysis providing assessment of the impact of policy changes, regulations, or industry practices from economic point of view.

As was mentioned earlier, forensic economics entails economic analysis that can be clustered into five groups. The first group includes direct observation methods. Precisely, the evidence of wrongdoing can be detected analyzing a pool of data collected by other parties and derived from audit of field experiments. The second group widely utilizes statistical tests, one of which is an approach where two variables of the same activity should produce similar results (in the absence of the wrongdoing). This group is divided into four subgroups: comparison the official data from the sources, comparison of the official data with second generated measure, comparison of the self-reported data and second-source data, and comparison of the inputs and outputs. The third group uses three economic approaches: to vary incentives for hidden behavior discontinuously, but other reasons for correlations continuously; to vary incentives experimentally; and to vary incentives naturally. The fourth group encompasses economic modeling and statistical modeling. Finally, the fifth group uses null hypotheses derived from financial or price theory.

Today, forensic economics is still widely confused with forensic accounting, but there is thought to be a distinction between them. We used such grammar construction mainly because the distinction is often ultrafine and indistinguishable.

Forensic accounting, also known as forensic accountancy or financial forensics, is a branch of accounting that entails traditional accounting principles coupled with auditing and investigative methods for the purpose of identification and investigation of the financial malpractices, mostly in business (Rechtman, 2020). Similarly to forensic economics, forensic accounting is a diverse field

contributing to a large number of potential disputes: commercial disputes (contractual, transactional, concerning shareholding and partnership, etc.), matrimonial disputes, property disputes, business interest disputes, insolvency cases, and even assistance in financial crimes (thefts, money laundering, and financial frauds). According to yet another sources, forensic accounting may contribute to evaluation of economic damages, investigation of tax and security fraud, valuation of the business, or analysis of the company`s financial status, and litigation; basically forensic accounting solves the same issues as forensic economics does (Mert, 2022; Ozili, 2023).

What is for sure is that practitioners in the field of forensic economics mandatory possess degree in economics. The optional degree can include degree in business, finance, and accounting. On the contrast, forensic accounting agents need bachelor's degree in accounting, and certificate or master`s degree in forensic accounting.

In addition, a boundary between forensic economics, academic economics, and corporate finance should be drawn: forensic economics is literally economics according to the rules of law; academic economics is dedicated more the study of theory; and corporate finance is mainly focused on financial decision-making in business sector.

Naturally, artificial intelligence technologies have started to penetrate forensic economics, as they have already done for many other fields of expertise. This phenomenon is justified by several trends the science evolution involves. First the amount and speed with which the data are generated and accumulated on the national and global levels as a result of expansion of electronic document flow and transactions, and second being the multi- and international nature of numerous areas forensic economics is assisting to.

In law in general, the AI assists in six main areas. The earliest application of the AI included document discovery. Later, certain areas of the lawyer expertise become automated, e.g. special software was created enabling to draft a person`s will without lawyer assistance. Automation was also spread to fast and accurate search in the large databases of legal information. In addition, the AI is able to manage the large amount of the company`s documents and reduce hundreds of thousands of hours of man labor to mere minutes. Finally, the AI is used to provide analytics both general and predictive (Davis, 2020).

In economics in general, the AI has a short history of presence (since the 1980s), however already influences numerous areas, some of which are writing, background research, coding, data analysis, e.g. analysis of rates of unemployment, economic trend forecasts, gross domestic product, inflation, growth and dynamic labour market theories, particularly economic recession forecasts, etc. (Gries & Naudé, 2022; Korinek, 2023), mainly through application of neutal networks and regression algorithms (Mete & Yomralioglu, 2022).

Similarly to all fields that apply the AI, forensic economics uses the AI technologies to develop faster and more accurate methods to perform tasks: in case of forensic economics, tasks of detection and prevention various frauds. Similarly to all other fields, forensic economics integrate computer systems with the AI the main functions of which are processing enormous amounts of data at lightning speeds, recognizing and interpreting patterns of different complexity, and predicting potential fraudulent activities. Concerning specific AI technologies applied, forensic economics mainly applies machine learning algorithms, predictive analytical techniques, natural language processing approach, and data visualization tools (Thaduri & Tuli, 2023).

Research Problem

The forensic economics, as well as practical implementation of artificial intelligence and machine learning methods, is relatively new field with limited amount of data. Taking into account highly individualistic approach of law firms that “supply” forensic experts, combination of numerous other fields of expertise for forensic economic researches, and heavy intersection of different sciences and

their approaches and methods, it is highly valuable to investigate the impact of the AI to work of the forensic economists: whether there is such an impact, for what tasks forensic economists could use machine learning algorithms, and what issues the AI overcomes in terms of expert`s practice.

Research Focus

The current scoping review is aimed at literature analysis of the ways forensic economists use the AI technologies in their practice.

Research Aim and Research Questions

In this scoping review we study the particular industries for which forensic economist could apply economic researches boosted with AI algorithms, what steps of the research the AI could enhance, what particular types of the AI could be involved and their impact.

Materials and Methods

This scoping review was conducted in compliance with PRISMA extension guidelines.

To search the literature sources, we used two free of charge, publicly open databases: Directory of Open Access Journals was used for the primary search, and Google Scholar used for refining.

To conduct the search we used a number of key words related to the AI (Artificial Intelligence and Machine Learning), key words related to the potential field of application (e.g., real estate, medicine, energy, insurance, etc.), key words related to specific forensic economics terminology (e.g., court, litigation, damage, loss, etc.), and key words related to economics in general (e.g., economics, economic research, economic theory, etc.).

We used the following inclusion criteria to select the articles: 1) articles cover original researches; 2) articles cover the use of the AI for calculations, preferably in economics; 3) articles mention practical implementation of the AI in the field that could be considered during litigations; 4) articles are published in journals; 5) articles are published in English only; 6) articles provide full text; 7) articles are published from January, 1, 2019 to present.

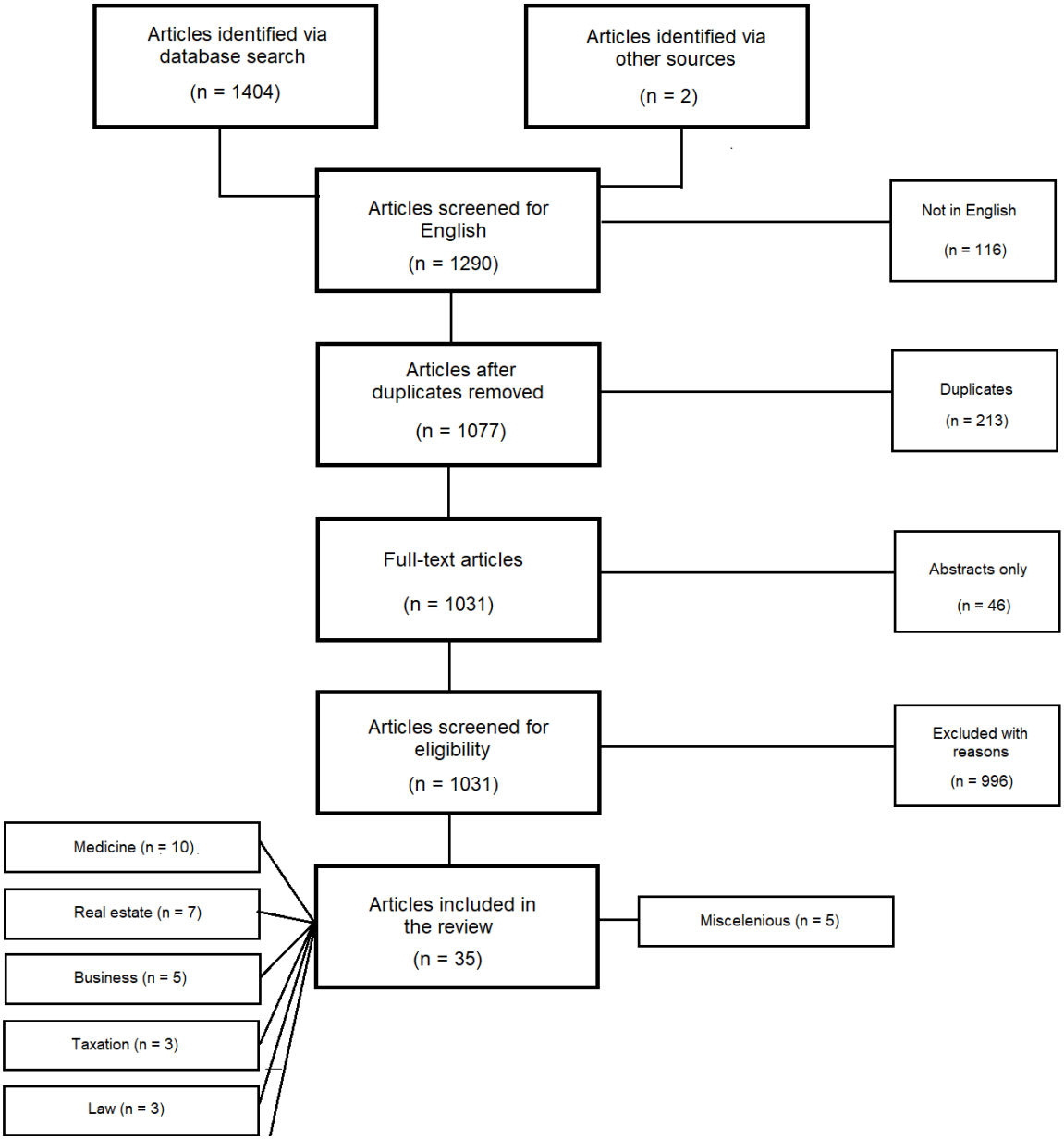
We used the following exclusion criteria to select the articles: 1) articles cover reviews; 2) articles do not provide full text; 3) articles published in another language (not English); articles published sooner before 2019.

Results

Figure 1 represents the flow diagram of this scoping review.

Figure 1

Flow Diagram of the Current Scoping Review



Source: Author's development.

Detailed results of the scoping review are given in Table 1 and reflect the main fields where forensic economics applies the AL, types of the applied AI, and its main roles.

Table 1

Detailed Results of the Current Scoping Review

Article identifier	Article title	AI method	AI role and main functions
Real estate industry			

Article identifier	Article title	AI method	AI role and main functions
Mete and Yomralioglu (2022)	A Hybrid Approach for Mass Valuation of Residential Properties through Geographic Information Systems and Machine Learning Integration	Geographical information system-based machine learning regression method	The main function of the machine learning in this work was to overcome the drawbacks of the regression models for mass valuation of the property and achieve higher accuracy in valuation
Singh et al. (2020)	Big data analytics predicting real estate prices	Random forest, generalized boosting, and liner regression methods	The main function of the machine learning in this research was to detect and selects the features that determine the property sale prices
Aydinoglu et al. (2020)	Implementing a mass valuation application on interoperable land valuation data model designed as an extension of the national GDI	Geographical information system-based machine learning method	The proposed method and developed valuation model allow real estate appraisal and property taxation
Yang et al. (2022)	Graph Convolutional Network-Based Model for Megacity Real Estate Valuation	Combined spatial regression and graph convolution neural network method	The developed model aims at overcoming instability of appraisals and difficulties in data acquisition, and validates the current property prices with accuracy of 98.13%, as well as future prices with accuracy of 97.80%
Kayakuş et al. (2022)	Forecasting housing prices in Turkey by machine learning methods	Decision tree regression and support vector methods and artificial neural networks	The main function of the ML in the selected study was to estimate the value of sq. m in residential areas
Hong et al. (2020)	A house price valuation based on the random forest approach: the mass appraisal of residential property in South Korea	Random forest method	The main function of the AI model was to automatically valuate the prices of a large number of real estate objects that can aid at calculation of the real estate taxes
Gnat (2021)	Property Mass Valuation on Small Markets	Multiple regression model, k nearest neighbor regression, and XGBoost regression methods	The AI aims at predicting mass land appraisal and property appraisal
Medical industry			
Snider et al. (2021)	Identification of Variable Importance for Predictions of Mortality From COVID-19 Using AI Models for Ontario, Canada	Logistic regression and machine learning (neural network, XGBoost, or random forest) method	The main function of the machine learning in this work was to assist logistic regression approach in predicting mortality from COVID-19. The authors also mentioned that the developed model can participate in planning and valuation of possible medical caseloads
Laino et al. (2022)	An individualized algorithm to predict mortality in COVID-19 pneumonia: a machine learning based study	Logistic regression method, random forest method, gradient boosting method, and extreme gradient boosting method	The authors developed a prediction score for in-hospital mortality caused by COVID-19 using machine learning approach. The main function of the machine learning in this work was to identify variables that can predict mortality

Article identifier	Article title	AI method	AI role and main functions
Tran et al. (2020)	Mortality Prediction of Patients With Cardiovascular Disease Using Medical Claims Data Under Artificial Intelligence Architectures: Validation Study	Logistic regression, gradient boosting tree, random forest, extra tree, and, deep neural network	The main function of the AI was to accurately predict risks of mortality for those who suffered from cardio-vascular diseases. All of the AI models demonstrated an accuracy of 97.0-98.0%.
Kim et al. (2024)	Deep learning model integrating radiologic and clinical data to predict mortality after ischemic stroke	3D deep neural network using brain imagining	The main function of the developed AI-based model was to predict one-year mortality after experiencing ischemic stroke
Lin et al. (2019)	Artificial Intelligence Prediction Model for the Cost and Mortality of Renal Replacement Therapy in Aged and Super-Aged Populations in Taiwan	Random forest and artificial neural network methods	The AI algorithm developed in this work aims at predicting one-year cost of dialysis and mortality during one year in specific group of individuals for the purpose of decision making
Haas et al. (2021)	Rule-Based Models for Risk Estimation and Analysis of In-hospital Mortality in Emergency and Critical Care	Association rule mining	The ML algorithm developed in this work aims at predicting mortality in emergency department and critical care department of hospitals
Chi et al. (2023)	Clinical Validation of Explainable Deep Learning Model for Predicting the Mortality of In-Hospital Cardiac Arrest Using Diagnosis Codes of Electronic Health Records	Deep SHapley Additive exPlanations model	The developed model predicted likelihood of 30-day mortality based on diagnosis input
Huang et al. (2021)	Machine-Learning Techniques for Feature Selection and Prediction of Mortality in Elderly CABG Patients	Logistic regression, random forest, nonparametric statistical method, classification and regression-tree algorithm, and XGBoost	Five ML algorithms were tested to select the input features and predict mortality of the specific population after artery bypass surgery grafting
Long et al. (2023)	Development and validation of an ensemble machine-learning model for predicting early mortality among patients with bone metastases of hepatocellular carcinoma	Ensemble method (exact algorithm were not indicated, but were chosen from artificial neural network, gradient boosting decision tree, eXGBoosting, decision tree, and support vector machine	Combined AI algorithm was applied to predict early mortality of the specific group of individuals (hepatocellular carcinoma with bone metastases)
Xiong et al. (2022)	A machine learning–Based model to predict early death among bone metastatic breast cancer patients: A large cohort of 16,189 patients	Logistic regression, gradient boosting tree, decision tree, and random forest	The AIs were tested to predict early mortality in specific group of individuals (breast cancer)
Insurance industry			

Article identifier	Article title	AI method	AI role and main functions
Orji and Ukwandu (2024)	Machine learning for an explainable cost prediction of medical insurance	Ensemble of one or more of extreme gradient boosting, gradient-boosting, and random forest	The main function was to predict medical insurance costs and key influence factors for the costs
Su et al. (2021)	A Decision Support System with Artificial Intelligence and Natural Language Processing to Mitigate the Deduction Rate of Health Insurance Claims	Big data analytical method	The role of the ML in this particular work was to examine insurance claims in order to reduce health insurance claim deduction rate
Business industry			
Hu et al. (2023)	Governance of artificial intelligence applications in a business audit via a fusion fuzzy multiple rule-based decision-making model	Fuzzy multiple rule-based decision making	The main role of AI in this research was to provide means for internal audit
Peykani et al. (2023)	The application of structural and machine learning models to predict the default risk of listed companies in the Iranian capital market	Random forest, gradient boosted decision tree combined with structural methods (Merton model and the Geske model)	The main function of the AI technology was to estimate the default risk of capital market companies in Iran that potentially influences the credit risks
Geraldo-Campos et al. (2022)	Machine Learning for Credit Risk in the Reactive Peru Program: A Comparison of the Lasso and Ridge Regression Models	Lasso and Ridge regression methods	AI aimed at predicting credit risks of the companies under the Reactiva Peru Program because of COVID-19 for the minimization of the risks of non-payment by the companies in the future. The best method turned to be Lasso method
Hung et al. (2023)	Factors affecting the quality of financial statements from an audit point of view: A machine learning approach	Decision tree, random forest, AdaBoost, gradient boosting, support vector machine, and k-nearest neighbors methods	The main purpose of the AI use in this work was to examine the quality of company financial statements
Zhao et al. (2022)	Research on PPP Enterprise Credit Dynamic Prediction Model	Combination of logistic regression and XGBoost	The AI models aimed at credit valuation and credit risk valuation of the business
Taxation sector			
Zheng and Li (2023)	Machine learning model of tax arrears prediction based on knowledge graph	Gradient boosting decision tree	The ML function was to predict the risks of tax appears

Article identifier	Article title	AI method	AI role and main functions
Visitpanya and Samanchuen (2023)	Synthesis of Tax Return Datasets for Development of Tax Evasion Detection	Generative adversarial network, k-nearest neighbor, decision tree, logistic regression, and neural network	The AI role was to detect the phenomenon of tax evasion using publicly available data from the financial statements of the registered companies and augmenting these data
Abedin et al. (2020)	Tax Default Prediction Using Feature Transformation-Based Machine Learning	Automated tax default prediction system based on testing of 13 machine learning algorithms	The main role of the ML in this work was to predict tax default
Financial industry			
Gao et al. (2020)	The Application of Stock Index Price Prediction with Neural Network	Multilayer perceptron, convolutional neural network, long short term memory, and attention-based neural network	The main function of the ML technology was to predict stock index price on the next day according to the retrospective data. Among the tested models, attention-based neural network demonstrated the best results
Economic sector			
Cicceri et al. (2020)	A Machine Learning Approach to Forecast Economic Recessions—An Italian Case Study	Autoregressive model, ordinary least squares regression, nonlinear autoregression models, nonlinear autoregressive with exogenous variables model, support vector regression, k-nearest neighbors, boosted trees	The main role of AI in this case was to predict economic crisis, which the models accomplished well, however could predict but not explain
Public sector			
Kalaycıoğlu et al. (2023)	Using machine learning algorithms to identify predictors of social vulnerability in the event of a hazard: Istanbul case study	Classification tree, regression tree, random forest, support vector machine, k-nearest neighbours, naïve Bayes, artificial neural network, and logistic regression methods	The primary role of the ML was to estimate the vulnerability of the social groups to the dangerous occupational factors. Artificial neural network demonstrated the best results
Ecological sector			
Chen et al. (2022)	A Quantitative Assessment on Ecological Compensation Based on Water Resources Value Accounting: A Case Study of Water Source Area of the Middle Route of South-To-North Water Transfer Project in China	K-means clustering method, long short-term memory network	The role of ML was to quantitatively estimate ecological compensation
Law sector			

Article identifier	Article title	AI method	AI role and main functions
Zheng et al. (2021)	PREDICTING THE LITIGATION OUTCOME OF PPP PROJECT DISPUTES BETWEEN PUBLIC AUTHORITY AND PRIVATE PARTNER USING AN ENSEMBLE MODEL	Ensemble of k-nearest neighbor, gradient boosting decision tree, and neural network	The function of ML algorithms was to detect the main causes of the legal disputes between public authorities and private enterprises, as well as predict the outcomes of the future litigations
Dal Pont et al. (2023)	Regression applied to legal judgments to predict compensation for immaterial damage	Natural language processing, and regression methods	The ML aimed at prediction of the compensation value for immaterial damage (described in relation to airlines)
Torres et al. (2023)	Legal actions in Brazilian air transport: A machine learning and multinomial logistic regression analysis	Naive bayes, support vector, random forest, and logistic regression	The role of ML algorithms was to detect the causes of judicial indemnities toward airline industry and predict the value of indemnities
Energy industry			
Kontogiannis et al. (2022)	Error Compensation Enhanced Day-Ahead Electricity Price Forecasting	Error compensation deep neural network	The ML models were developed to predict day-ahead electricity price

Source: Author's development.

Discussion

Out of 1406 academic papers, for this analysis we selected 35 articles that cover the application of the AI in valuation, estimation, and direct calculations.

The review revealed that not one of 35 articles intentionally provided the AI models and algorithms for the purpose of economic research in forensic economics, however, all of them were focused could become auxiliary tools for the forensic economic researches.

Medical Industry

Out of ten selected articles, all concerned prediction of risks of mortality of different groups of individuals and did not indicate any potential use for forensic economics purposes. Two articles covered COVID-19-related mortality, four cardiovascular associated mortality, one renal failure associated mortality, one critical condition, and two cancer mortality. Moreover, AI-based model predicted mortality associated with both diseases and surgical procedures. Although the main focus of the ML-models was mortality prediction, forensic economics operates with a term related to mortality – life expectancy, and worklife expectancy, and distinctly related topic such as wrongful death and personal injury.

Therefore, for forensic economics purposes, we are able to deduce that described AI-based models for mortality risk prediction can found their application in valuation of loss of earning capacity and analysis of the related claims, estimation of the costs of the future care, calculation of the life expectancy, etc. during litigations.

Insurance Sector

Health insurance sector provides a big amount of various data regarding each and every patient, a portion of this data is available as health insurance claims and related insurance information. This particular information could contribute to analysis of population aging and an increase in comorbidities

and mortality (Krefting et al., 2023), and, in forensic economics context, might become an auxiliary tool for calculation of damages related to health care procedures and during insurance disputes.

Out of two selected articles, Orji and Ukwandu (2024) described use of the ML algorithms for prediction of insurance costs in medical industry, and Su et al. (2021) used ML for ultimate aim of reduction of insurance related costs (health insurance claim deduction rate).

Therefore, for forensic economics purposes, we can deduce that this cost estimation algorithms could contribute to the economic evaluation during various insurance disputes and litigation.

Real Estate Industry

Summarizing seven selected articles, the AI is mainly used for valuation and prediction of the real estate object prices, however does not particularly state potential application in forensic economics.

Generally speaking, property valuation is valuation of the market value of the property (discrete house, developed areas, or land) depending on its location, architecture, condition, etc. The problem with price valuation is often absence of the exact publicly-open prices, unwillingness of government or private representatives to disclose the necessary information, variability and complexity of the factors that influence the prices, which create an obvious issue with data acquisition. For these reasons, scientists started to integrate AI technologies in order to develop house price valuation/prediction AI-based models to classify and analyze big amounts of variables, and calculate current or future prices for the real estate objects (Gabrielli & French, 2020; Kara et al., 2020).

Seven selected articles indicate potential contribution of the developed AI models to numerous academic and industrial fields, e.g., systematic planning and management of urban areas, systematic planning of policy and decision-making, loan mortgage review, etc. Notably, the developed models allow estimating different aspect of the property, e.g., prices of sq. meters only, the whole building, or the whole district, right at the moment or predict future trends. In terms of forensic economics, we can deduce the contribution of this knowledge in marital and business disputes when dividing the assets, bankruptcy disputes, tax issues solvency, damage or compensation calculations, etc.

Business Industry

Similar to real estate valuation, business valuation is a process dedicated to determination of the value of an asset. Business value is an extremely important factor when considering selling existing business, acquisition a new one, or merging, determining the intellectual property value. The main methods to valuate a company include market capitalization, times revenue method or earnings multiplier, discounted cash flow method, book value, and liquidation value (Derindere Köseoğlu & Awad Almeany, 2020).

For business industry we selected five articles that might be beneficial when applying in forensic economics, however again no one stated any potential application in forensic economics. Hu et al. (2023) described application of machine learning for performing internal audit of the companies by identification cause-and-effect relationships between dimensions and criteria, and identification key factors that influence efficiency and quality of the internal audit by identification. Hung et al. (2023) applied machine learning to investigate a correlation between company characteristics and the quality of its financial statements that is critical information for decision making, for example during company acquisition or merging. Geraldo-Campos (2022), Peykani et al. (2023), and Zhao et al. (2022) used machine learning approach to determine credit risks that can end up with default and bankruptcy.

For forensic economics purposes, business is valuated during bankruptcy litigations, company liquidation, disputes between shareholder, disputes regarding share values, partnership withdrawing, taxation, and even divorce disputes, with the main purpose of estimating the damages. However, minor study of law firms` web-pages shows that business valuation is thought to be professional area of the forensic accounting agents, not economists. On the contrast, P.L. Anderson in his book titled “The

Economics of Business Valuation. Towards a Value Functional Approach" describes a range of the valuation means from the field of economics (first place in the list), finance, accounting, taxation, and management. Thus, exhausting business valuation lays in the intersection of different sciences including economics, and economics methodology coupled with AI, examples of which we highlighted above, could be successfully used for valuation for litigation purposes.

Taxation Sector

Following the previous subparagraph, we selected three articles that predict different aspects of the tax risks for the business: tax appears by Zheng and Li (2023), tax evasion by Visitpanya and Samanchuen (2023), and tax default by Abedin et al. (2020). The developed approach can add additional contribution in the business evaluation during litigations, especially in cases of intentional hiding or withholding of company related information.

Similarly to the previous section, the developed AI algorithms could find potential use during various business litigations, and litigations regarding real estate and its taxation.

Law Sector

The law sector articles provided interesting insights into how AI might be used for the very process of litigation and its outcomes. Thus, extremely valuable for the all law practitioners, forensic economists including, is the article of Zheng et al. (2021) who created an ensemble machine learning algorithm to predict the outcomes of the litigations based on the main causes of these litigations. Torres et al. (2023) adopted the similar approach for airline industry to predict the value of indemnities based on the causes. Finally, the work of Dal Pont et al. (2023) is more an intersection of the person and law, and covers machine learning algorithm for prediction of material compensation for the immaterial damage.

Miscelenious

Other types of litigation that can benefit from AI application are economical sector, energy, public, and ecological sector. Similarly to the previous sectors and industries, here, the AI is mainly used for detection variables and prediction outcomes.

Artificial Intelligence

Regarding the exact types of the AI, the most widely used and efficient AIs are neural networks and regression algorithms.

In economic research, regression algorithms model the relationship between a target variable and one or more independent variables. In other words, they are algorithms that predict an output variable based on input features, which serves to make predictions of numerical values, and detect intricate patterns and trends. The practical benefits of regression algorithm use are numerous and vast: prediction of the stock prices, economic forecasting, prediction of the healthcare costs, sales forecasting, etc.

Our scoping review identified that the authors used the most widely used regression algorithms, tested them against each other to detect the best accuracy in the given conditions, and create a hybrid made of several regression algorithms. The most often used algorithms were random forest, liner regression algorithm, Lasso regression algorithm, decision tree algorithm, and support vector algorithm.

Neural networks, in economic research, serves for statistical data analysis by recognizing the patterns and segmenting the data through a finite number of observations. Our scoping review found that the authors mainly used deep neural networks not only for pattern recognition, but also for reinforcement of the regression algorithms to achieve the highest accuracy possible. For the same

purposes, some authors used big data analytics that also serves to uncover the trends, patterns, and correlations.

Additionally, specific machine learning algorithms were used such as combination of the AI with geographical information system, a computer system that captures, stores, analyzes and displays geographical information (geographical of farms, trees, streams, schools, roads, etc.). Another example is fuzzy decision-making algorithms that provide a choice from a set of alternatives.

Conclusions and Implications

In summary, the artificial technology is slowly but steadily finding its way into forensic economics to recognize existent patterns, provide valuation and estimation, and help to make decisions. Our review revealed that the field that use the AI the most are business for business valuation and prediction of different risks, real estate for the house valuation, medicine for prediction of mortality, and law for, unexpectedly, prediction of the litigation outcomes.

Although, none of the 35 selected articles clearly stated their relation to the forensic economics, developed AI-based algorithms and models can potentially make a significant contribution into forensic economics for solvency of business-related disputes, personal damage related disputes, insurance disputes, and even marital disputes.

Suggestions for Future Research

In the process of conduction this review we identified a number of issues for the future researches. One of them is lack of clear and unambiguous conceptual framework for forensic economics and forensic accounting, and lack of clear and unambiguous distinction between these two disciplines, at least in the English resources. We acknowledge that forensic economics can operate with methods and concepts from absolutely different sciences depending on the particular litigation. Thus, it worth studying practices of the law firms and their cases to develop better understanding of the subject.

The second research is worth to being focused on the considering methods for the economic researches, and the way the AI could contribute to their development and simplification in terms of time and amount of man labor.

Finally, in the process of conduction this review we spotted an interesting ambiguity: the AI is used for overcoming the discrimination issues in healthcare and labor sector, but in the same time the AL creates this discrimination in recruitment sector, for example. Therefore, these two sides of one coin are worth studying in the future.

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Conflict of Interest

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