

SBORNÍK

prací účastníků vědeckého semináře
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Fakulta informatiky a statistiky
Vysoké školy ekonomické

Abstrakty



Vědecký seminář se uskutečnil dne 29. ledna 2025
pod záštitou děkana FIS
prof. Ing. Jakuba Fischera, Ph.D.

Sestavení sborníku
prof. Ing. Petr Doucek, CSc.
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Předmluva

Na přelomu ledna a února proběhla tradiční akce Fakulty informatiky a statistiky „Den doktorandů“. Seminář se konal 29. ledna 2025 pod gescí děkana Fakulty informatiky a statistiky prof. Ing. Jakuba Fischera, Ph.D. Jednalo se o jubilejní již třicátý ročník této, mezi doktorandy, oblíbené akce.

Přestože má fakulta tři studijní programy doktorského studia, celkový počet doktorandů, kteří presentovali výsledky své vědecké práce byl poměrně skromný – celkem pět doktorandů. Do tohoto kroužku přispěl studijní program „Aplikovaná informatika“ (AI) čtyřmi účastníky a studijní program „Ekonometrie a operační výzkum“ (EOV) pak účastníkem jedním.

Hodnotící komise posoudila vystoupení doktorandů a na jejich základě určila nejlepší vystoupení bez ohledu na zastoupení doktorský studijní program FIS. Jeden z účastníků byl pak odměněn čestným uznáním děkana FIS. V letošním roce tak získal prestižní „Cenu děkana FIS“, s níž je spojena i symbolická finanční odměna, student:

Ing. Petr Hoza, A Case Study on Evaluating Reasoning in Large Language Models, školitel: prof. Ing. Petr Berka, CSc., Katedra informačního a znalostního inženýrství, Studijní program: Aplikovaná informatika

Čestné uznání děkana FIS pak získal:

Ing. Martin Konopásek, Unemployment Rate Analysis by Using Complex Explanatory Model, školitel: doc. Ing. Tomáš Formánek, Ph.D., Katedra ekonometrie, Studijní program: Ekonometrie a operační výzkum

Oceněným studentům doktorského studia upřímně blahopřeji a pevně věřím, že získané zkušenosti uplatní při své další práci, ať už vědecké nebo v praxi. Uznání také patří všem vědeckým a pedagogickým pracovníkům FIS – školitelům doktorandů, kteří se

„Dne doktorandů“ zúčastnili a svým vedením a radami byli nápomocni při zpracování příspěvků.

Nedílnou součástí „Dne doktorandů“ je i práce hodnotících komisí, jejichž členové pečlivě sledují jednotlivá vystoupení a potom vybírají nejlepší práce k ocenění. Za práci v hodnotící komisi děkuji prof. Ing. Vojtěchu Svátkovi, Dr. (Katedra informačního a znalostního inženýrství), prof. RNDr. Ing. Michalu Černému, Ph.D. (Katedra ekonometrie) a Mgr. et Mgr. Ing. Františku Sudzinovi, PhD. (Katedra systémové analýzy). Komise se zhostila své práce s přehledem a její práce byla na vysokém stupni odbornosti.

Na závěr bych chtěl vyjádřit zvláštní poděkování studijní referentce doktorského studia paní Ing. Tereze Krajičkové, DiS, díky níž byl seminář skvěle zajištěn po organizační stránce, dále pak paní Ing. Martině Jandové za technickou a administrativní podporu a paní Mgr. Lee Nedomové za práci při editaci a sestavení tohoto sborníku abstraktů.

prof. Ing. Petr Doucek, CSc.
proděkan pro tvůrčí činnost a zahraniční vztahy

**STUDIJNÍ PROGRAM
APLIKOVANÁ
INFORMATIKA**

A Case Study on Evaluating Reasoning in Large Language Models

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This article deals with assessing the deductive reasoning capabilities of Large Language Models (LLMs)—specifically early GPT-4 and GPT-3.5—by employing a novel game-based methodology. Building on a modified “Pick a Number” paradigm, the study evaluates the impact of increasing complexity levels on each model’s performance. The difficulty lies in the LLM’s need to “fake” remembering a chosen number, thereby testing its ability to handle more intricate transformations that mimic human cognitive processes. Experiments focus on identifying the “critical complexity step,” at which performance deteriorates, and investigating whether advanced prompting techniques, such as chain-of-thought or adaptive strategies, can mitigate this decline.

Two contradictory yet valid perspectives emerge from our findings. On one hand, we (unsurprisingly) observe that LLM performance is fundamentally constrained by model size: larger models can handle more complex transformations and may display instances of “self-awareness” by outright refusing to continue “faking” memory in certain situations—a behavior suggesting an internal assessment of capability that smaller models do not exhibit. We also see that LLM performance is tightly bound by transformation complexity, implying a fundamental ceiling that cannot be easily overcome. On the other hand, although we initially hypothesized that specialized prompting strategies would significantly enhance reasoning thresholds across all model sizes, our early results do not reveal statistically significant performance boosts attributable to prompting alone. Nevertheless, new prompting methodologies suggest that finely tuned prompts might still slightly extend this ceiling, enabling models to tackle more complex tasks than previously assumed.

Methodologically, we compare baseline performance against multiple prompt variations, employing statistical analyses (e.g., ANOVA) to draw robust conclusions. Early results do reveal differences in how LLMs respond to complexity escalations, which underscores the importance of clarifying the boundaries and enhancement strategies of LLM reasoning. By examining how both complexity and model size influence performance, our study contributes to efforts that refine the testing of future language models. We argue that further testing—especially with more advanced models is needed to explore the underpinnings of model “self-awareness” to its limitations.

Keywords: Large Language Models, Deductive Reasoning, Prompt Engineering, AI Testing.

JEL Classification: C69, D89, Y40

Ontology-Based Agility: A New Framework for Sustainable Organizational Evolution

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As the economic and technology landscape is becoming more and more unstable and unpredictable, which has been labelled by the term VUCA (Volatile, Uncertain, Complex, Ambiguous), organisations need to develop capabilities enabling a smoother continuous redesign of their various business capabilities in order to stay in touch with their many stakeholders and environments in which they operate. Organizations need not only to adapt to changes but also to strategically anticipate them. This organizational ability is no longer a „nice-to-have“ source of competitive advantage – but a key capability enabling sustainable market presence for many organisations globally.

PhD program providers, as participants in the global marketplace, are facing these challenges in their specific formats. Securing funding for existence and successful sustainable evolution is a question of vital importance for research institutions offering this form of training for early career researchers. And right now the national as well as international landscape of available funding resources is evolving at a fast pace and in a disruptive manner.

That is why the domain of PhD funding was selected as the initial area to serve as a basis for development of a novel framework, which will serve the management as a tool for sustainable organizational evolution. This research investigates an ontology-based method allowing organizations to leverage and improve currently applied business and enterprise architecture approaches to organizational design to more sustainably and predictably meet the ever-changing demands of primarily investors, customers, and regulatory bodies. In addition to anchoring these approaches in latest applied ontological content and methods, additional useful perspectives are also being added to the framework to amend

contemporary methods allowing for a more robust and more holistic approach to strategic investments in development of required business capabilities and their more precise timing. Specifically, this study examines the intersection of organizational agility and sustainability, with applications in PhD-level research funding with planned application in circular economy for purposes of validation of the newly designed artifacts.

Keywords: Organizational Agility, Sustainability, Applied Ontology, Business Capability Evolution, VUCA, Organizational Design, Strategic Management, Strategic Foresight, PhD Funding, Circular Economy.

JEL Classification: L25, M15, O31

Data Governance and Data Management in B2C Digital SMEs

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This article examines the challenges faced by B2C digital small and medium-sized enterprises (SMEs) in the Czech Republic in the realm of data governance and data management. It combines insights from a systematic literature review with empirical findings from a case study involving three digital SMEs. The study evaluates the applicability and effectiveness of three data governance frameworks—DAMA-DMBOK, COBIT for SMEs, and a framework proposed by Alsousi and Shah—in addressing these challenges. Through semi-structured interviews and qualitative analysis, the research identifies key obstacles such as the lack of formal data strategies, unclear roles and responsibilities, and minimal emphasis on documentation and security. The findings underscore the need for tailored, scalable, and resource-efficient data governance frameworks for SMEs. Practical recommendations are offered to enhance data governance and management practices, ensuring alignment with business objectives and improved organizational resilience.

Keywords: Data Governance, Data Management, SMEs, B2C Digital Enterprises, DAMA-DMBOK, COBIT.

JEL Classification: M15, O33

Predictors of viral spread

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The concept of news values, i.e. the signs that a news item contains, makes it the right one for the media, originated with Walter Lippman in 1922. The whole concept is gradually being developed by Jonah Berger and other colleagues from the University of Pennsylvania, when they examine what signs of a news item mean that it will be widely disseminated. Their work deals with the American or English-speaking environment. The essence of this presentation is to think about viral values on social networks in Czech groups.

The presentation answers the following research questions: Is the influence of images and links in posts on the number of likes, sharing and comments counts significant, if we take into account Czech-speaking groups? Is there a relationship between the numbers of likes and sharing?

Large Czech Facebook groups (over 40 thousand followers) with various focuses were selected for the data. For this research total of 6 groups were selected about sports, animals, cities and professions. The data was downloaded using the Apify scraper in May 2024. A total of 3000 posts were downloaded. There were 1036 posts with a photo, 1964 without a photo, 657 with a link, 2343 without a link.

Data was further analyzed using statistical methods for comparing two normal distributions (F-test, t-test). These tests tested the hypotheses of the first research question, rewritten into statistical hypotheses such as: “Posts with an image/link have the same number of likes/shares/comments as posts without an image/link.” Pearson's correlation coefficient is used for the second research question, e.g. correlation between number of sharing and likes.

The results are that posts containing images have more likes, shares and comments. As for the number of comments, the opposite is true – posts that do not contain links to other pages have statistically significantly more likes, shares and comments. The hypothesis of a zero correlation

between likes and shares was also rejected, even when excluding zero values.

So it can be said that people prefer things that are graphic and pictorial and don't like being linked to other sources.

The selection of groups may be a limitation of the research, the number of groups and contributions still needs to be expanded, however, some interesting patterns can still be seen.

Keywords: Social networks, Facebook, virality.

JEL Classification: M31

**STUDIJNÍ PROGRAM
EKONOMETRIE A OPERAČNÍ
VÝZKUM**

Unemployment Rate Analysis by Using Complex Explanatory Model

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The relations between macroeconomic variables distributed over time and space could be very complex. Therefore, when performing empirical analysis, it is important to take into account as many assumed features of the examined variables as possible. Article show the application of dynamic panel regression model to the unemployment rates of five European countries. This model works on panel data with hierarchical cross-sectional dimension (two levels) and accounts for numerous features that one could expect within modeled relationships. Specifically, the model allows for modeling spatial and temporal dynamics (and heterogeneity), spatially heterogeneous responses, random response parameters, and heteroskedasticity while using both exogenous and endogenous regressors, defined with variation at both cross-sectional levels in one framework.

Keywords: Linear panel model, spatial and temporal dynamics, spatial heterogeneity, random response parameters, endogenous regressors, unemployment rate, labor dynamics.

JEL Classification: C13, C15, C23, C26, C51, C61, E24