TAILOR

Poster pitches!

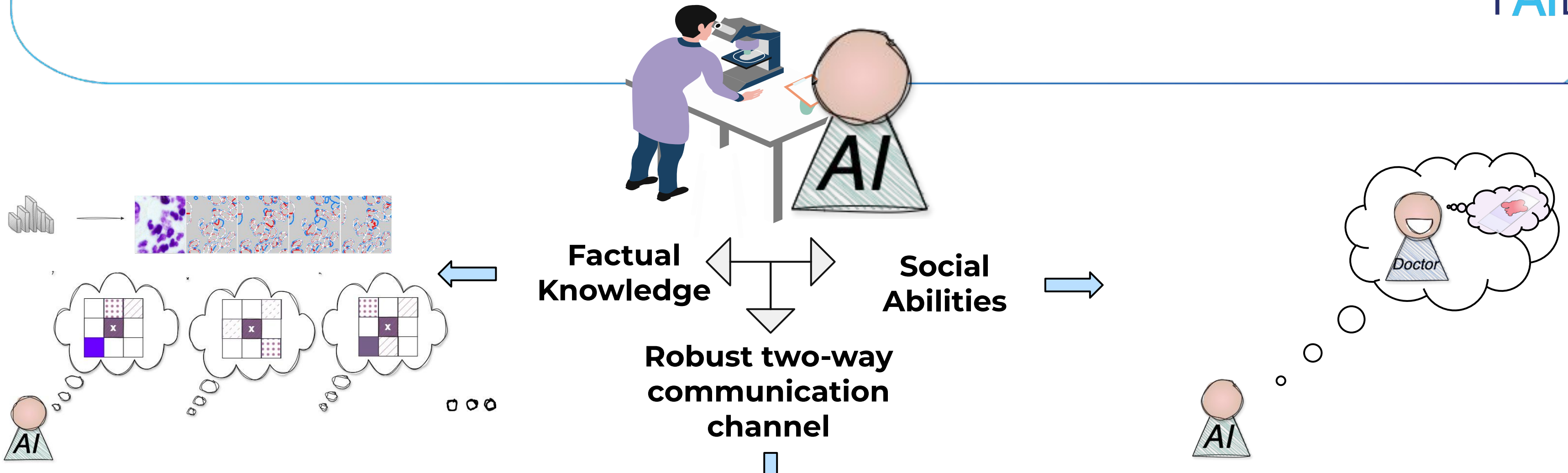
TAILOR Conference #4

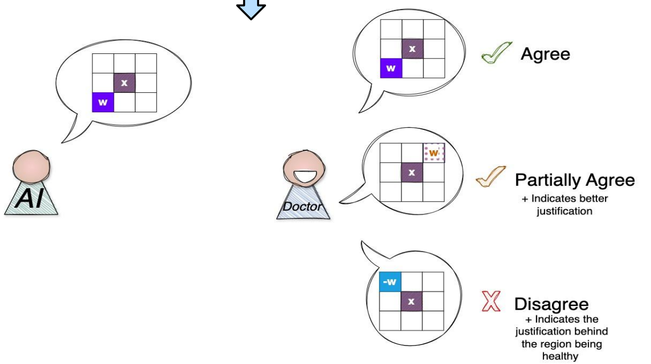
2024-06-04

This project is funded by the EC
under H2020 ICT-48, GA 952215

Towards Human-Centric AI Companions in Healthcare

Andra Cristiana Minculescu





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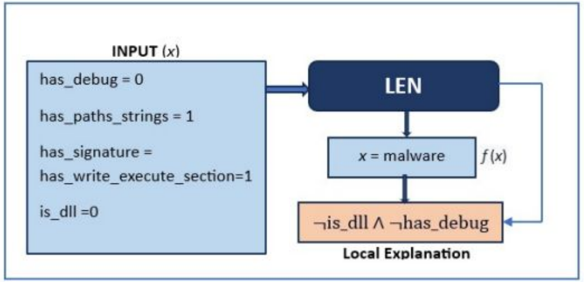
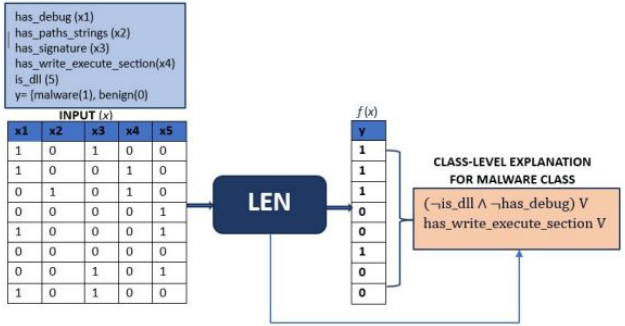
Tailored Logic Explained Networks for Explainable Malware Detection

Anthony P., Giannini, F., Diligenti, M., Homola, M., Gori, M., Balogh, S., & Mojzis, J.



(a) Local explanation for single sample



(b) Class-level explanation

Highlights

LENs: Interpretable by design neural networks

- **Investigate LENs:** Investigate the effectiveness of LENs in a malware detection task, comparing its performance with black box and interpretable approaches.
- **Improve rule extraction process:** Formalize a variation of the rule extraction process that improve over the original LEN.
- **Evaluate the Explanations:** Perform an in-depth analysis on the LENs extracted rules when increasing the feature size of the inputs in terms of fidelity, complexity and accuracy.

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RecViT: Enhancing Vision Transformer with Top-Down Information Flow

Štefan Pócoš, Iveta Bečková, Igor Farkaš
Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava (Slovak.AI)

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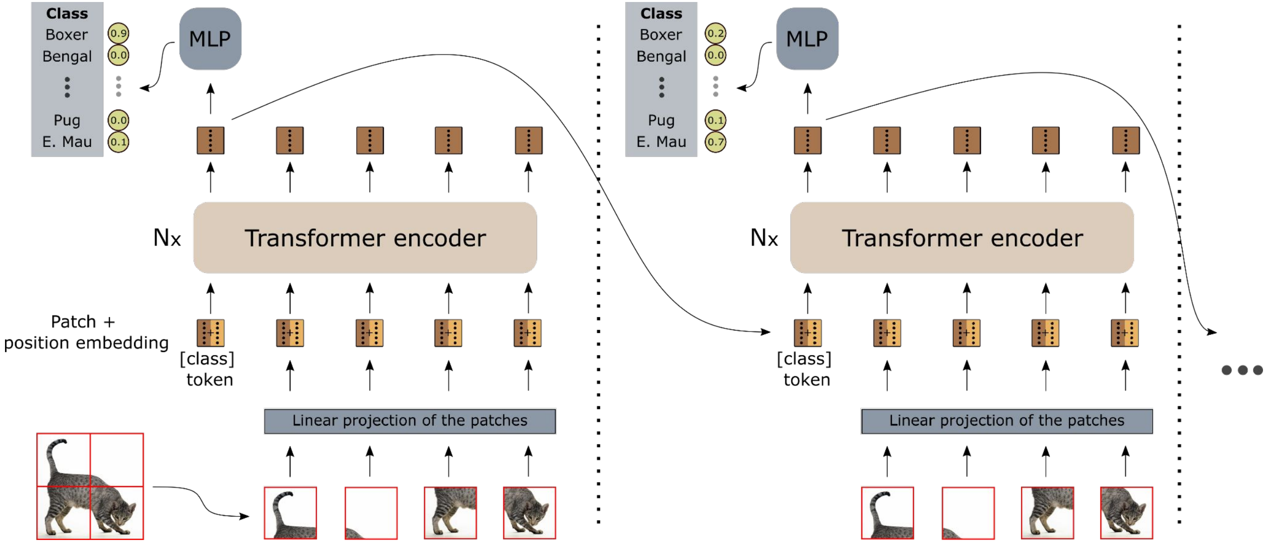
Contributions

- Incorporation of top-down signal processing
- Analysis of adversarial examples

Results

- Higher inherent robustness with minimum drop of accuracy
- Potential to distinguish adversarial examples from clean data

Proposed Recurrent Vision Transformer (RecViT)



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Meta-Path Learning for Multi-relational GNNs

Francesco Ferrini, Antonio Longa, **Andrea Passerini**, Manfred Jaeger
University of Trento and Aalborg University

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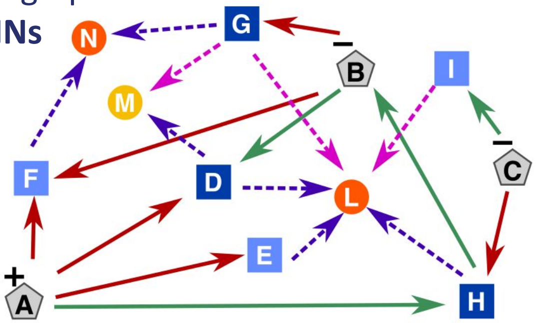
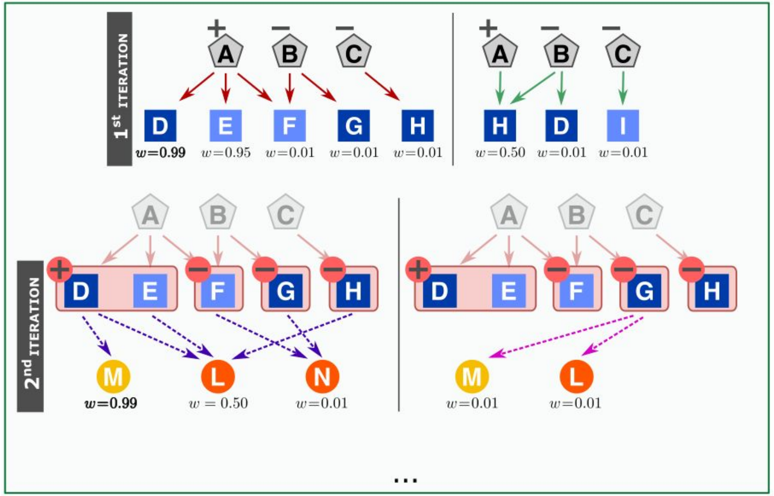
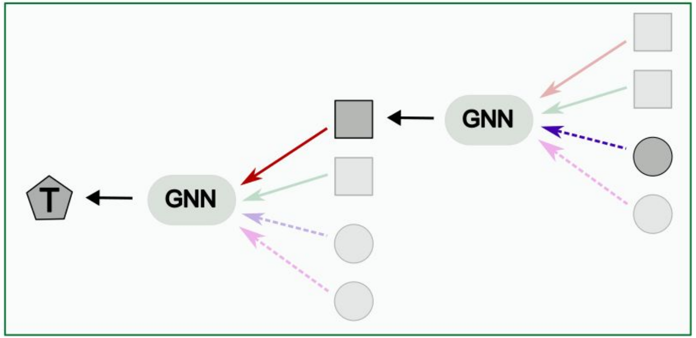
1) Multi-relational graphs are **hard for plain GNNs**



2) A **scoring function** measures **potential informativeness** of partial metapaths



3) A **meta-path GNN** leverages extracted meta-paths



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Insights from the R2Net Workshop

2/3 of academics experience mental health

Graduate students are 6x more likely to experience symptoms of depression and anxiety

37% of academic staff indicated a mental health disorder

>20% of postdocs show signs of moderate to severe clinical depression

Ph.D. Life - Panel Discussion

- Panelists:
  - Dr. Marigo Raftopoulos, **Post Doc**. at Tampere University
  - Dr. Jelke Bloem, **Assistant Professor** at University of Amsterdam
  - Matej Vajda, **Psychotherapist** and students' counselor at University of Ljubljana
- Overview: Discussed challenges in Ph.D. life, including coping with feedback, publishing, stress management, and multitasking.

European Space Agency (ESA) Φ-Lab Presentation

This project is funded by the EC
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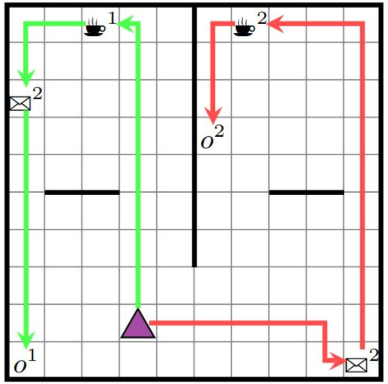
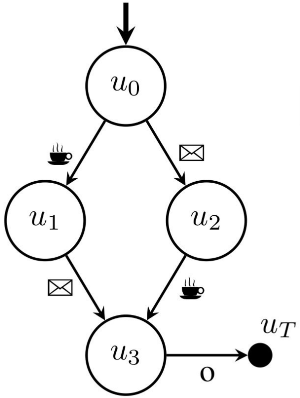
Planning with a Learned Policy Basis to Optimally Solve Complex Tasks

David Kuric, Guillermo Infante, Vicenç Gómez, Anders Jonsson and Herke van Hoof (U Amsterdam, U Pompeu Fabra)





Summary of contributions

- A novel algorithm for hierarchical reinforcement learning in non-Markovian tasks
- The algorithm first learns a **convex coverage set** of policies for the Markovian part of the environment
- The non-Markovian reward function is provided as a **finite state automaton**
- **Zero-shot generalization**: find optimal weight vector for each automaton state using dynamic programming
- First hierarchical reinforcement learning algorithm with **global optimality guarantees**

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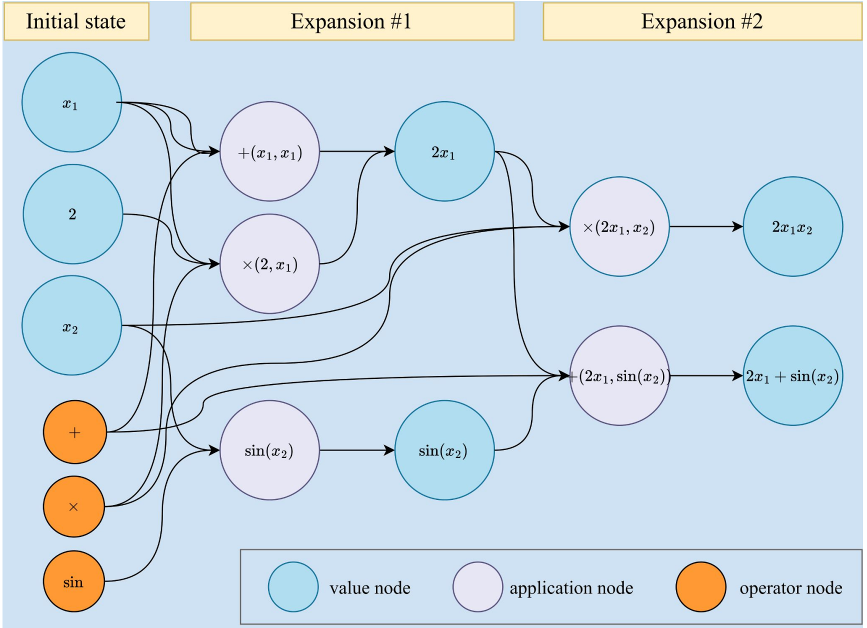
Neuro-Guided Graph Expansion for Symbolic Regression

Piotr Wyrwiński and Krzysztof Krawiec, Poznan University of Technology, Poland (PUT)



Highlights

- **Symbolic regression (SR)**: given a set of mathematical operators and constants, synthesize a formula/model that fits the training data.
- **NUDGE** performs prioritized search in the graph representing candidate solutions (SR models).
- Prioritization provided by a **bespoke Graph Neural Network (GNN)**.
- **Outperforms baselines** on larger SR tasks.

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Coherence in Natural Language Explanations of Recommendations

Jerzy Stefanowski, Jakub Raczynski, Mateusz Lango
Poznan University of Technology

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Deep neural networks in NLP recommenders

- Challenges: lack of coherence between rating of objects and the text explanations
  - Observed for SOTA methods

Prediction (out of 5)	Explanation	Coh.
5	this is a wonderful film	✓
4	it's a goofy comedy that isn't funny	✗
1	the cast is very good	✗
5	they have a great drink selection	✓
5	the parking lot is always full	✗
2	the staff is very friendly and helpful	✗

Our contributions:

- CER - New coherent explanation DNN recommender
- Automatic evaluation technique (BERT based)
- Human and experimental evaluation

	% of coherent explanations		
	Yelp	Amazon	TripAdvisor
PETER+	65,0	60,0	82,5
CER	68,0	63,5	89,0
Gold standard	73,5	70,0	74,0

More = also my presentation at **TrustLLM workshop** on 4th June at 15.30 – 17.30.

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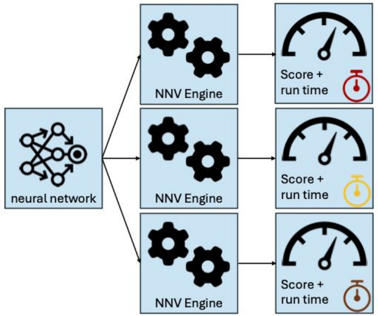
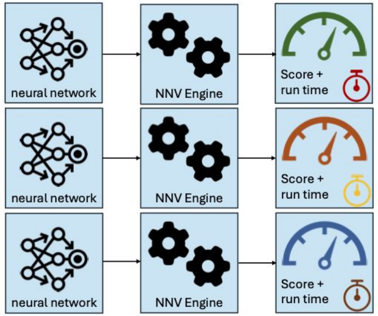
Multi-Objective AutoML: Towards Accurate and Robust Neural Networks

robustness verification to prevent adversarial attacks

relevant algorithm selection problems related to neural network verification



select NNV engine that determines most efficiently robustness



given a set of neural networks, select the most robust neural network

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Learning to Learn without Forgetting Using Attention

Anna Vettoruzzo, Joaquin Vanschoren, Mohamed-Rafik Bouguelia, Thorsteinn Rögnvaldsson

"How can we prevent AI models from forgetting old tasks when learning new ones?"

Contributions: We propose to integrate a meta-learned optimizer into a continual learner model to selectively updates only the model parameters specific for each task.

Results: Automating the optimization strategy enhances the backward and forward transfer of knowledge.

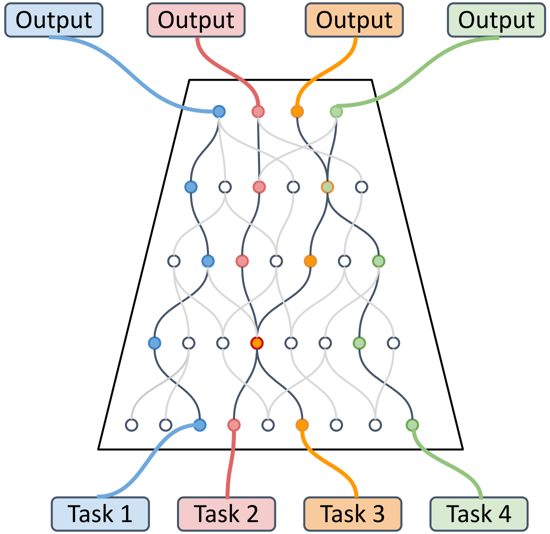

*Image inspired from Google blog

This work was supported by the Tailor Connectivity Fund.

This project is funded by the EC under H2020 ICT-48, GA 952215

TAILOR CONNECTIVITY FUND

Investigating meta-modeling languages to better characterize the hidden semantics of knowledge graphs.

Zekeri Adams, Martin Homola, Jan Kluka, Vojtech Svatek.

- Meta modeling involves modeling the structure and relationships of other models.
- MLT* provides a structure for modeling of domains with multiple classification levels. This theory provides the foundation for the language, ML2.
- PURO is a graphical language for kick starting the structure of ontologies, for instance OWL. It can also be used as a standalone graphical language for describing real-world situations.
- We apply these meta-modelling languages to study patterns and anti-patterns in Wikidata using the graphical tool, PURO modeler.

This project is funded by the EC under H2020 ICT-48, GA 952215

DeiSAM: Segment Anything with Deictic Prompting

Hikaru Shindo, Manuel Brack, Gopika Sudhakaran, Devendra Singh Dhami,
Patrick Schramowski, Kristian Kersting

TECHNISCHE UNIVERSITÄT DARMSTADT

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Task

Visual Input

Segmentation Output

Deictic Prompt

"An object that is on the boat, and that is holding an umbrella."

Reason on objects and relations on complex **visual scenes** dealing with **textual prompts**

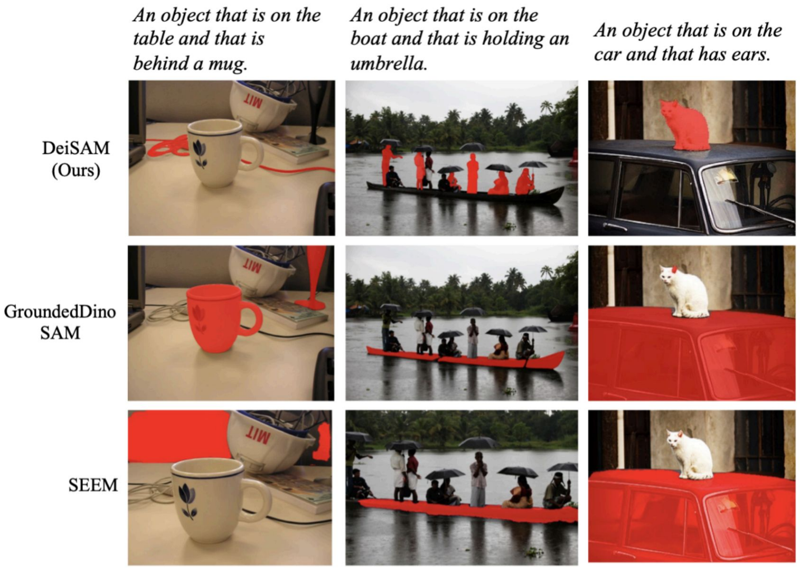
Our Approach (DeiSAM)

Neuro-Symbolic Reasoning (Differentiable Reasoner)

\+

Large-scale Neural Networks (GPT, SAM)

Result



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TAILOR CONNECTIVITY FUND

Comprehensive and intelligent analysis for precision medicine applied to brain tumors

Jose Carlos Sola Verdú

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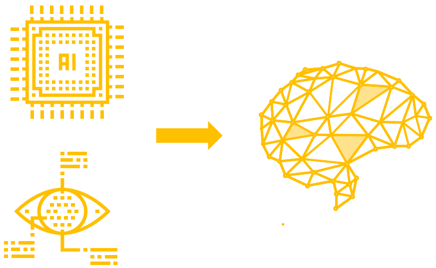
MOTIVATION

- Improved Diagnosis and Treatment of Glioblastomas.

HOW?

- Using CNN models

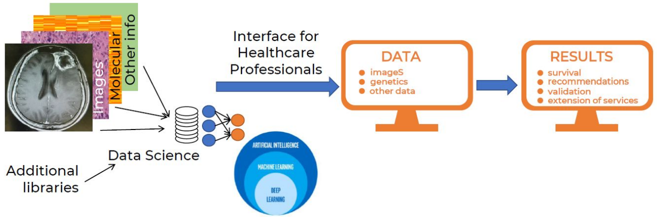


EXPECTED RESULTS

- Reduced diagnostic times.
- Improved clinical decision making.

IMPACT & FUTURE

- Implementation in Hospitals.
- Improvement of public health.
- Continuation of the fight against cancer.



aiju Technological Institute for children's products & leisure

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Leveraging Social Agents as Mediators to Foster Trust and Comprehension of Affective Engagement with Digital Content

Sergio Muñoz
Universidad Politécnica de Madrid

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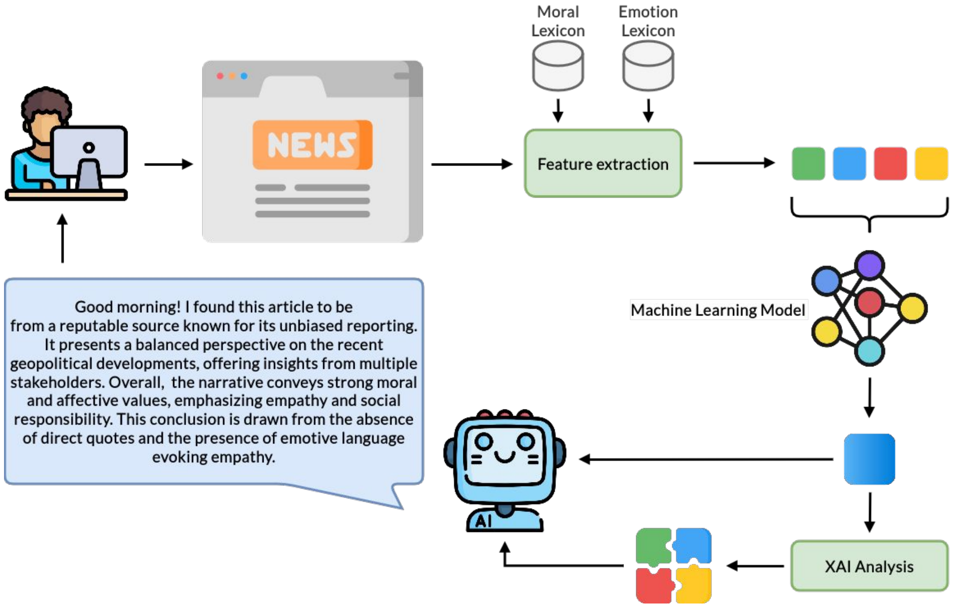
➢ Content Comprehension: Interaction with social agents as content mediators is expected to enhance users' comprehension of digital content compared to traditional interfaces.

➢ Affective Regulation: Cooperation with social agents as content mediators is anticipated to lead to better regulation of users' affective responses while reading digital content.

➢ Trust in AI: The provision of transparent explanations by social agents is expected to increase users' trust in AI technologies as content mediators.



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An Evolutionary Deep Learning Approach for Efficient Quantum Algorithms Transpilation

Zakaria A. Dahi, Francisco Chicano and Gabriel Luque
Univ. Lille, Inria, CNRS, Centrale Lille, UMR 9189 CRIStAL, F-59000 Lille, France
ITIS Software, University of Malaga, Malaga, Spain

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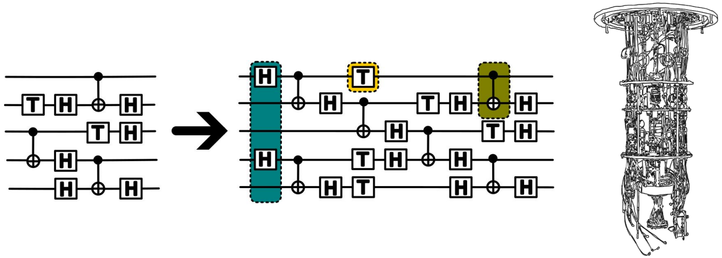
①



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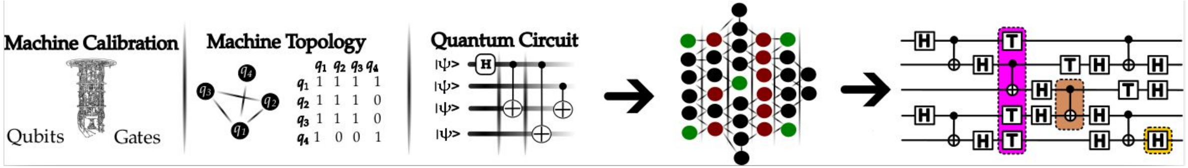

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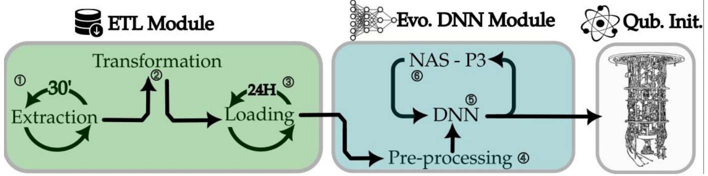


Model	Best	Worst	Median	MAD
SOTA-DNN	3.1856	9.9488	5.2786	0.9618
P3-DNN	2.6378	5.4681	**3.2379**	0.3076

④

Jay Gambetta • Following
IBM Fellow and VP of IBM Quantum
4d • Edited •

As we continue to focus on the performance of Qiskit. Im happy to share our latest work on enhancing circuit transpiling with AI.

In this work (https://lnkd.in/e2svJQjm), the team lead by David Kremer applies Reinforcement Learning (RL) to synthesis and routing, two important tasks within circuit transpiling.

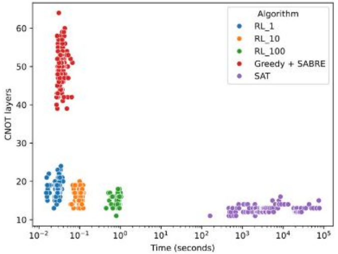
The method achieves a remarkable balance between the quality of the circuits produced and the computational cost, achieving close to optimal results orders of magnitude faster than generic optimization methods such as SAT solvers.

For circuit routing, they show results up to 133 qubits, with significant improvements in circuit depth and CNOT count versus other heuristics routing methods.

For circuit synthesis, they show results for linear functions, Cliffords and permutation circuits (up to 9, 11 and 65 qubits respectively), achieving close to optimal circuits in less than a second of computation. The synthesis works with the native gate sets of the devices, and respects the connectivity constraints, so it can be used as a powerful optimization stage in the final steps of the transpiling pipeline.

We have integrated this as part of our AI-enhanced Qiskit Transpiler Service. You can use the AI-based transpiler passes as building blocks, or directly use our AI-enhanced transpiler pipeline, where we observe a 20-50% improvement in CNOT count and depth for typical circuits.

To start using it for your own circuits see the documentation
https://lnkd.in/eYG2gB2x



This project is funded by the EC under H2020 ICT-48, GA 952215

A Strategic Analysis of Prepayments in Financial Credit Networks

Hao Zhou, Yongzhao Wang, Konstantinos Varsos, Nicholas Bishop, Rahul Savani,
Anisoara Calinescu, Michael Wooldridge

UNIVERSITY OF OXFORD

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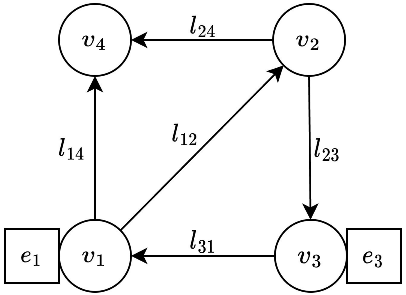

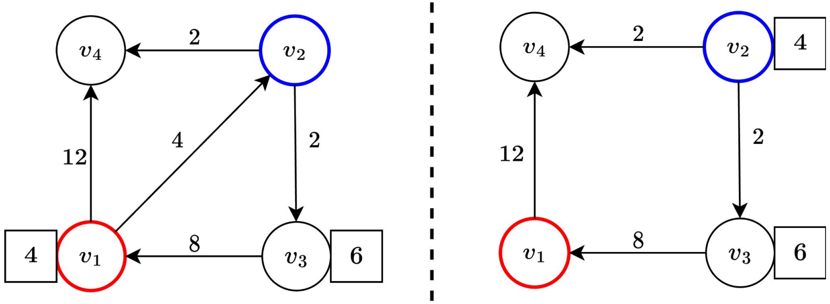

Highlights

- Define **prepayment games** formally in financial networks.
- Examine the **existence, (in)efficiency, and computational aspects** of equilibria in prepayment games.
- Simulate firms' equilibrium behavior in prepayment games using **empirical game-theoretic analysis (EGTA)**.

This project is funded by the EC under H2020 ICT-48, GA 952215

A Card-based Agentic Framework for Supporting Trustworthy AI

Mattheos Fikardos, Katerina Lepenioti, Dimitris Apostolou, Gregoris Metnzas

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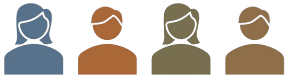
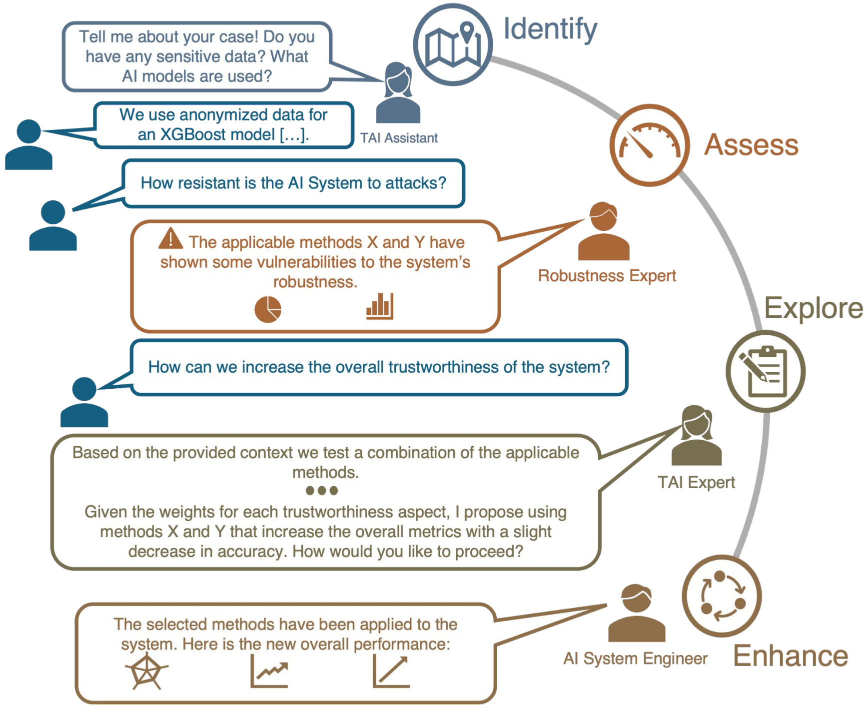
Trustworthiness Knowledge Graph

Agentic Framework

LLM-based Multi-agent System



Trustworthiness Experts



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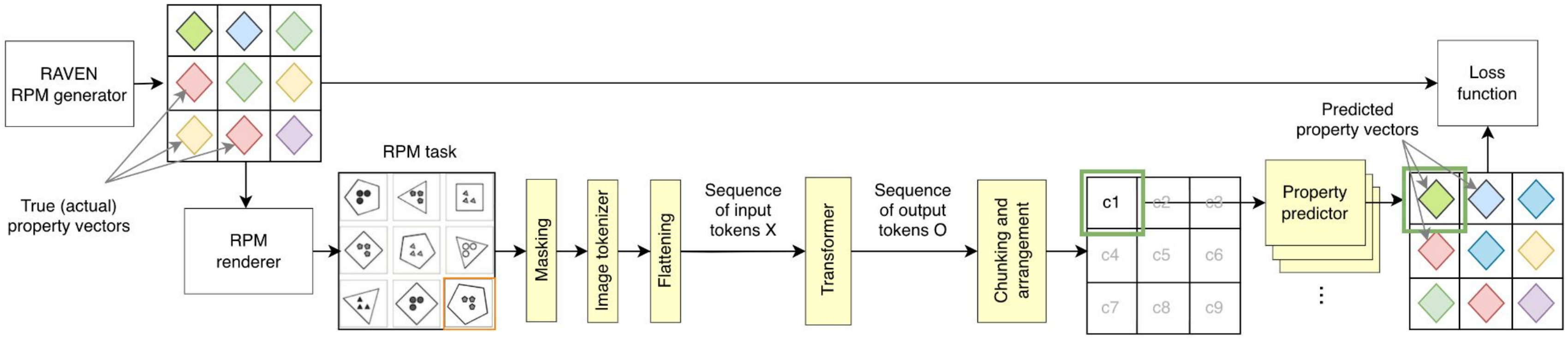
Self-supervised Learning of Tokenized Representations for Raven Progressive Matrices

Jakub Kwiatkowski and Krzysztof Krawiec, Poznan University of Technology, Poland (PUT)



Highlights

- A neural architecture based on the **transformer** blueprint.
- The model **predicts properties** of RPM panels and then **chooses** an answer panel based on those predictions.
- **Best-to-date capability of solving benchmark problems**.
- Partial **transparency**: models can be inspected in terms of the predictions they make about properties of panels.
- **Resistant to biases** present in some datasets.

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Optimising Communication Overhead in Federated Learning Using NSGA-II

José Ángel Morell, Zakaria Abdelmoiz DAHI, Francisco Chicano, Gabriel Luque, and Enrique Alba
ITIS Software, University of Malaga, Spain

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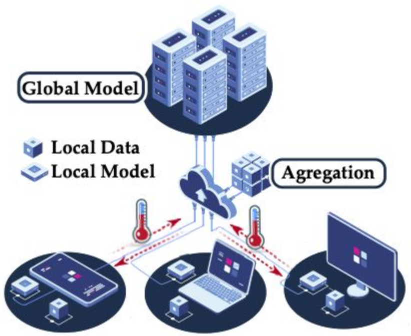
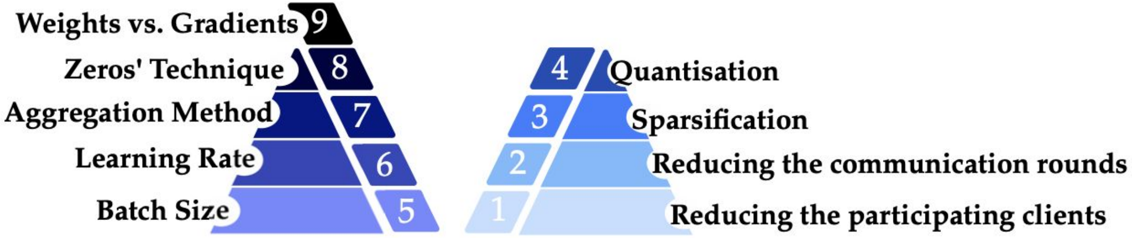
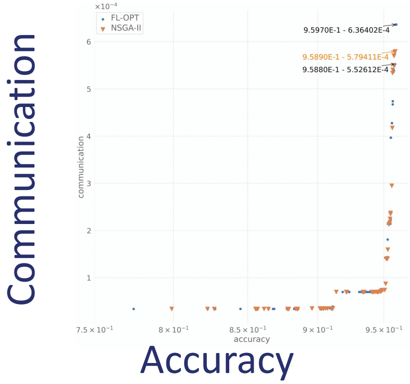




Workflow of Federated Learning



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On the Variation of Max Regret with respect to the Scaling of the Objectives

Nic Wilson, Insight, University College Cork

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- In a decision making problem with multiple objectives, with partial knowledge of user preferences, max regret is a kind of measure of how close an alternative is to being necessarily optimal.
- It can be used to recommend alternatives, and in generating informative queries, for learning more about the user preferences, in order to find an optimal alternative.
- However, it is affected by how the objectives are scaled (e.g., using cents rather than euros for cost): and this is often somewhat arbitrary.
- I show how max regret can be made more robust by reasoning over a set of different scalings, thus making max regret more trustworthy.

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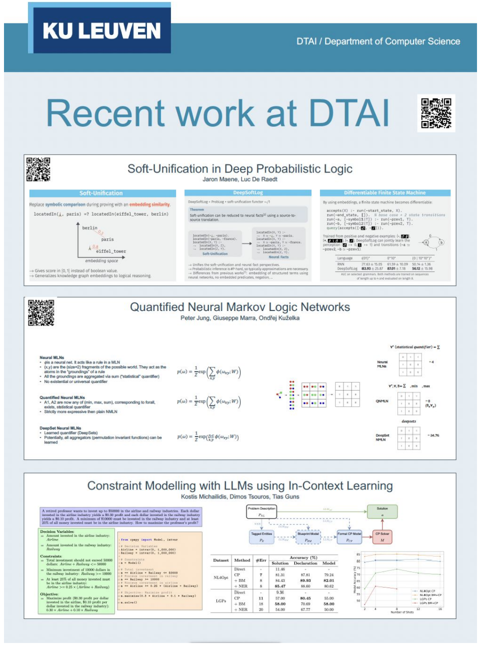
Recent work at DTAI, KU Leuven

- Soft-Unifcation in Deep Probabilistic Logic
  - Jaron Maene, Luc De Raedt
- Quantified Neural Markov Logic Network
  - Peter Jung, Giuseppe Marra, Ondřej Kuželka
- Constraint Modelling with LLMs using In-Context Learning
  - Kostis Michailidis, Dimos Tsouros, Tias Guns



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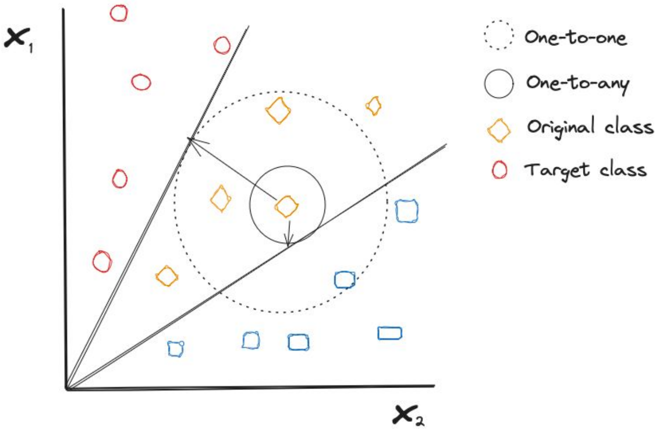
Examining Per-Class Performance Bias via Robustness Distributions



Per-class robustness performance bias exists.

Contributions: Neural network verification to provide a nuanced assessment of per-class robustness performance bias.

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Thank you!

The end

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