Tolga Recep Uçar

tolgarecepucar@gmail.com — linkedin.com/in/tolgarecepucar — github.com/tolgarecep — tolgarecep.github.io

EDUCATION

BSc Mathematics
2020-2024
Yıldız Technical University
Relevant Courses: Computer Programming, Data Science, Linear Algebra, Probability and Statistics, Differential Equations, Partial Differential Equations, Mechanics, Electromagnetic Theory, Game Theory, Markov Chains, Network Analysis, Decision Theory

EMPLOYMENT

Data Engineer
2023-
Turkish Airlines Technic
Integrating, consolidating and cleaning data and structuring it for analysis and modeling at Turkish Technic, the MRO of Turkish Airlines. Developing clustering, supervised and unsupervised learning solutions for component planning problems.

RESEARCH

Orthogonal embedding-based neural network for solving ordinary differential equations
Pre-submission
We propose a numerical algorithm based on neural networks for solving linear and nonlinear ordinary differential equations. We combine the representational power of orthogonal space of Jacobi polynomials and multilayer perceptrons. Our method presents low-cost and highly accurate approximations with basic training. Some of the tinkering before the actual architecture was designed can be found here.

Transformer-based Variational Autoencoder
TUBITAK granted research (2247-C)
Supervised by Prof. Dr. Mehmet Fatih Amasyalı. We propose an alternative VAE architecture inspired by the inner workings of the ubiquitous Transformer. We also diagnose the condition of posterior collapse on the latent space and aggressively train the encoder to create an efficient model overcoming this. Finally the architecture is trained on a large Turkish corpora and tested on various tasks such as sentiment analysis and text classification. Publicly available here.

PROPOSALS

Solving Abel type differential equations using multilayer perceptron
International Conference on Mathematical Analysis and Applications in Science and Engineering - ICMASC'24
June 20th - 22nd 2024
Accepted for on-site oral presentation and print
We propose machine learning as a new method for solving Abel type differential equations which is an important class of differential equations modeling magnetostatic problems and fluid dynamics. Our method does not rely on extensive formal numeric computing. It is a data-driven algorithm, hence a significant approach as data is more available each day. Our approximation function is a multilayer perceptron and we adjust parameters by backpropagation algorithm. We compare our results with some well-known approximate results.

PROGRAMMING SKILLS

Python, R, Java, MATLAB
SQL, Pandas, NumPy, Matplotlib
JAX, PyTorch, Captum
Git, Weights & Biases, LaTeX

INTERESTS

Film theory
Modernism