Letter of Intent and Previous Work

D. Gueorguiev, 10/28/2025

My interests include mathematical modeling via

convex and combinatorial optimization, reinforcement learning, probabilistic models, graph theory and dynamic programming algorithms. Interested in using probabilistic methods for creating suitable estimators and root cause analysis.

Currently researching various MCP-enabled RAG, Agentic, and GraphRAG architectures for text generation and their applicability in certain contexts relevant to Nike.

Examples of my recent work and research interests are:

a) RAG and Agentic AI workflows and relevant vector retrieval techniques as discussed in this repo and this repo.

b) redesign of the online Fulfillment algorithm using the ε-constraint method, replacing the weighted objectives method for scalarization , reformulating the problem as Mixed Integer optimization problem. For details refer to this document and this document.

c) research and design classical and Deep Learning algorithms for various image processing tasks such as synthetic noise generation, generative fill and shadow processing. I have two repos with code samples related to this work – smooth_gradient_outpaint and image_crop.

d) research various reinforcement learning Policy Gradient algorithms such as PPO, applying those to Deployment Optimization and Fulfillment Optimization problems. For the purpose used the gymnasium environment and stable-baselines3 library.

e) research various algorithms for Root Cause Analysis using Bayesian inference and Probabilistic Temporal Logic. For the purpose exploring the usability of causal inference algorithms included in the packages causal-learn, causalml and dowhy. For details refer to this document and this document.

My coding experience involve python, C++, C, Java.

Samples of my python code can be found here:

algorithms for smooth gradient outpainting

https://github.com/dimitarpg13/smooth_gradient_outpaint

image crop algorithm using object segmentation with the Dichotomous Segmentation Deep Learning model:

https://github.com/dimitarpg13/image_crop

Here are samples of my C++ code from past endeavors:

https://github.com/google/or-tools/compare/stable...dimitarpg13:ortools:dpg/PWL_solver_stable_py2.7_gtest_scipV6

https://github.com/dimitarpg13/testcode/blob/master/fraction.cpp

https://github.com/dimitarpg13/testcode/blob/master/fraction_mt.cpp

https://github.com/dimitarpg13/testcode/blob/master/fraction_bigint.cpp

https://github.com/dimitarpg13/cpp_testcode/tree/master/SudokuQlik/src

And here are relevant documents to software design, architecture, coding techniques and design patterns:

https://github.com/dimitarpg13/BigIndex/blob/main/PresentationDGueorguiev2018.pdf

https://github.com/dimitarpg13/InsideTensorflow2Source/blob/master/Understanding_Tensorflow_2_source_code.pdf

https://github.com/dimitarpg13/UnderstandingPythonEcosystem

https://github.com/dimitarpg13/inside_cpp_object_model

And here are few repos about C++ language details and features:

https://github.com/dimitarpg13/cpp_effective_modern

https://github.com/dimitarpg13/cpp_move_semantics
https://github.com/dimitarpg13/cpp_templates_complete_guide
https://github.com/dimitarpg13/cpp_random_pieces