Letter of Intent and Previous Work

D. Gueorguiev, 06/19/2024

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 `GenAI` algorithms and their applicability in certain contexts relevant to Nike.
Examples of my recent work are:
a) redesign of the online Fulfillment algorithm using ε constrain method, replacing the weighted objectives method for scalarization , reformulating the problem as Mixed Integer optimization problem.
b) research various reinforcement learning Policy Gradient algorithms such as PPO, applying those to Deployment Optimization and Fulfillment Optimization problems. For the purpose is using the `gymnasium` environment and `stable-baselines3` library.
c) 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`.

Here are few repos representing my interests in those topics. All these repos are work in progress and will be updated periodically.

https://github.com/dimitarpg13/personal/blob/main/MLInterests.md

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

Samples of my python code can be found in my current work on image crop algorithm using semantic segmentation:
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%20Tensorflow%202%20source%20code.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

Additionally, in my free time I am looking into an implementation of *semantic simulation* for semantic search and semantic inference using reinforcement learning. Short description on Semantic Simulation can be found here:

https://github.com/dimitarpg13/aiconcepts/blob/master/docs/SemanticStructures/README.md
https://github.com/dimitarpg13/aiconcepts/blob/master/docs/SemanticStructures/SemanticSimulation.docx
https://github.com/dimitarpg13/semsimula/blob/main/README.md