Prof. Audrey Sedal

Assignment 2

Appendix A – Topic and Data Set Ideas

Below are some resources that might be helpful in finding a project topic.

Robotics:

Reviews:

<https://ieeexplore.ieee.org/abstract/document/9386154>

<https://www.jmlr.org/papers/volume22/19-804/19-804.pdf>

Data Sets:

BAIR Robot Pushing: <https://sites.google.com/berkeley.edu/robotic-interaction-datasets>

ACRONYM: A Large-Scale Grasp Dataset Based on Simulation: <https://sites.google.com/nvidia.com/graspdataset>

/

Paper: <https://arxiv.org/pdf/2011.09584.pdf>

Evolution Gym: A Large-Scale Benchmark for Evolving Soft Robots: <https://proceedings.neurips.cc/paper_files/paper/2021/file/118921efba23fc329e6560b27861f0c2-Paper.pdf> / <https://github.com/EvolutionGym/evogym>

Robot Tracking Benchmark: <https://zenodo.org/records/7548537>

Possible project questions given above topics:

* Can I predict whether some grasps are more likely to fail using a feed-forward neural network?
* In Evolution Gym, can I apply soft actor-critic to optimize a soft robot?
* Using the BAIR Robot Pushing Data set, can I categorize which part of the picture corresponds to the object that’s being pushed?
* Can I use a particle filter to track a robot?

Biomechanics:

Data sets and simulators:

MySuite/MyoSim: <https://sites.google.com/view/myosuite/> / <https://ieeexplore.ieee.org/document/9811684>

Example problem: Can I use RL (PPO) learn how to activate muscles to grab a cup?

Thermo/Energy:

Data set:

<https://data.nrel.gov/submissions/118>

Possible project:

* Can I use a Bayesian inference to predict the location of a manufacturing plant based on its thermal energy use, employment size, and end use?

Solid mechanics:

Perspective / Literature Reviews: <https://www.sciencedirect.com/science/article/pii/S0022509623000352>

<https://asmedigitalcollection.asme.org/appliedmechanicsreviews/article/75/6/061001/1164429/Recent-Advances-and-Applications-of-Machine>

Data sets:

Soft robotics materials database: <https://zenodo.org/records/3931808>

Possible projects using above:

* Using the Soft robotics materials database, can I categorize what type of material is being tested given only a window of data points?

Fluids:

Literature Review:

Brunton et al., Machine Learning for Fluid Mechanics

<https://www.annualreviews.org/doi/abs/10.1146/annurev-fluid-010719-060214>

Data sets:

<https://research.tudelft.nl/en/organisations/fluid-mechanics/datasets/>

<https://www.nature.com/articles/s41597-021-01034-2>

<https://sites.uw.edu/cfmlab/cfmdatabase/>

(need to sign up)

<https://www.research-collection.ethz.ch/handle/20.500.11850/515488>

Example project:

* Using the supplementary data of the article “3-dimensional Particle Image Velocimetry based evaluation of turbulent skin-friction reduction by spanwise wall oscillation”, can I predict the velocity of particles next frame using their last 2 positions?

Astronomy:

**Data set:**

<https://simbad.cds.unistra.fr/simbad/sim-display?data=meas>

(There are many others.)