Eamonn Tweedy, Ph.D.

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TECHNICAL SKILLS AND KNOWLEDGE

- **Python libraries:** Pandas, NumPy, Scikit-learn, SciPy, PyTorch, XGBoost, Statsmodels, Matplotlib, Seaborn, Plotly, NLTK, Hugging Face Diffusers and Transformers, Streamlit, Gradio
- **Machine learning and statistical models:** linear models, KNN, SVM, decision trees, clustering, ensemble models, MLP, CNN, RNN, GAN, LLMs, encoders and decoders, transformers, diffusion, ARIMA, (Neural) Prophet.
- **Data science principles:** dimensionality reduction e.g. PCA, LDA, manifold learning; data cleaning and feature engineering; and data exploration and visualization
- **Math expertise:** Calculus and differential equations, linear algebra, abstract algebra, statistics and probability, graph theory and discrete math, geometry, and topology.
- Proficiency in SQL (PostgreSQL, MySQL), LaTeX, Git, Microsoft Office Suite

EXPERIENCE

- **Built BikeSaferPA**, a machine learning model which predicts the severity of bike crashes in Pennsylvania.
  - Procured and cleaned PENNDOT cyclist crash data from 2020-2021, created data visualizations which reveal prevalence of crash factors and their influence on severity, and designed a feature engineering pipeline.
  - Selected salient input features using a baseline logistic regression model, and then selected BikeSaferPA - a gradient boosted decision tree model - using a cross-validation process and randomized search hyperparameter optimization.
  - Explained BikeSaferPA's predictions and its feature importances using a SHAP value analysis, and articulated concrete recommendations for improving cyclist crash outcomes in Pennsylvania based on my findings.
  - Designed a BikeSaferPA web app, allowing users to visualize the data and experiment with the model.

  Try out the BikeSaferPA web app: `https://bike-safer-pa.streamlit.app/`
  View my project on GitHub: `https://github.com/e-tweedy/BikeSaferPA`

- Trained a **U-Net convolutional neural network** to perform **brain tumor region segmentation** on MRI image data.
  - Trained a 3-dimensional U-Net on the BraTS 2020 challenge dataset of 3-d multimodal MRI images, using significant data augmentation to avoid overfitting.
  - Implemented test-time augmentation for more robust model predictions; on the holdout test set, the model achieves mean Dice scores of 0.89, 0.80, and 0.74 on the whole tumor, tumor core, and enhancing tumor regions, respectively.

  View my project on GitHub: `https://github.com/e-tweedy/UNet_BraTS2020`

- Built a **RoBERTa language model for extractive question answering** by fine-tuning a base model on v2 of SQuAD (Stanford question answering dataset).
  - The model achieves approximately 80% exact-answer-match accuracy on the evaluation dataset.
  - Designed a web app which demonstrates both standard Q&A functionality and Wikipedia-assisted Q&A functionality.

  Try out the Q&A web app: `https://huggingface.co/spaces/etweedy/roberta-wiki`
  View the web app's GitHub repository: `https://github.com/e-tweedy/roberta-wiki-app`
  View the fine-tuning project on GitHub: `https://github.com/e-tweedy/roberta-qa-squad2`

Tenured Associate Professor of Math — Widener University | 2019-2023
Assistant Professor of Math — Widener University | 2014-2019
G.C. Evans Instructor of Math — Rice University | 2011-2014

- Planned, coordinated, and executed individual and collaborative research projects in math. I have authored or co-authored seven peer-reviewed academic articles published in national and international math journals and presented my research at invited seminars and national conferences.
  View my Google scholar profile:
- 12 years of experience developing and teaching advanced math courses to undergraduate and graduate students, earning outstanding teaching evaluations from students and praise from colleagues.
- Chaired a University-wide faculty Committee on Technology and Instructional Resources at Widener (2019-2022).

EDUCATION

Ph.D. in Math (2011) & M.A. in Math (2007) — Univ of California Los Angeles | 2006-2011 | Cum. GPA 3.848
B.S. in Applied Math & B.S. in Physics — North Carolina State Univ | 2002-2006 | Cum. GPA 3.929