Jacopo Teneggi

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EDUCATION

Johns Hopkins University — Baltimore, MD
PhD in Computer Science — 2022—present

- Advisor: Prof. Jeremias Sulam
- Relevant coursework: (EN.553.730) Statistical Theory, (EN.553.740) Machine Learning I, (EN.601.682) ML: Deep Learning, (EN.580.709) Sparse Representations in CV and ML, (EN.601.674) ML: Learning Theory, (EN.553.739) High-Dimensional Probability.

MSE in Biomedical Engineering — 2020—2022

- Concentration: Biomedical Data Science
- GPA: 3.93/4.00
- Master's Thesis: *"Multiple-Instance Learning as a Framework to Explain via the Shapley Value"*, committee: Prof. Jeremias Sulam (Advisor), Prof. Soledad Villar, Prof. Adam Charles

Politecnico di Torino — Torino, Italy
BS in Biomedical Engineering — 2017—2020

- GPA: 3.93/4.00
- Honors:
  - IEEE HKN Mu Nu Chapter Member
  - Awarded full scholarship *"Young Talents"* (top 4% applicants)

PRIZES AND AWARDS

RSNA Trainee Research Prize in Imaging Informatics, RSNA 2022 Annual Meeting [abstract]

Best Paper Award, Workshop in Interpretable Machine Learning in Healthcare (IMLH), ICML 2021 [oral]

POSTER AND ORAL PRESENTATIONS

RSNA 2022 Annual Meeting—Scientific Presentation [slides]

SIIM 2022 Conference of Machine Learning in Medical Imaging [oral] [slides]

SIAM 2022 Conference on Mathematics of Data Science [slides]

Princeton Machine Learning Theory Summer School 2022 [poster]

ICML 2021, Workshop in Interpretable Machine Learning in Healthcare [oral] [poster]

RESEARCH PROJECTS

Reducing the Number of Labels for ICH Detection in CT Scans, Johns Hopkins University — 2022

- Devised a novel model architecture to detect intracranial hemorrhage (ICH) in Head CT scans.
- Trained models at scale using Microsoft Azure Machine Learning and MSR's Project InnerEye.
- Illustrated weakly supervised learning outperforms supervised learning for ICH detection.
- Won the Trainee Research Prize in Imaging Informatics at the RSNA 2022 Annual Meeting.
- Authored a publication currently under review. [preprint]

Conditional Independence Testing via the Shapley Value, Johns Hopkins University — 2022

- Proposed *"SHAPLIT"*: a novel conditional independence testing procedure for machine learning models.
- Unveiled an original relation between the Shapley value from game theory and this procedure.
- Granted the Shapley value with a precise statistical meaning for the first time.
- Authored a publication currently under review. [preprint]

Fast Hierarchical Games for Image Explanations, Johns Hopkins University 2022

- Developed *"h-Shap"*: a hierarchical extension of the Shapley value for vision models.
- Outperformed the current state of the art (e.g., SHAP, LIME, Grad-CAM) by orders of magnitude.
- Made the code publicly available and ready to use for other researchers. [code]
- Authored a journal article accepted for publication in IEEE TPAMI. [paper]
- Won a Best Paper Award at IMLH 21.

Distributed Pretraining of Large Language Models on Biomedical Corpora, nference, Inc. 2021

- Processed terabytes of biomedical literature and unstructured clinical notes.
- Built a distributed pipeline to pretrain Large Language Models on GCP.
- Outperformed production-level models on BLURB: the biomedical task benchmark.
- Compared our results with state-of-the-art models (e.g., SciBERT, PubMedBERT).
- Presented my results to the entire company to conclude my internship.

Entropy estimation within in vitro neural-astrocyte networks, Georgetown University 2020

- Developed MATLAB code to analyse electrical recordings of in vitro neural-astrocyte networks.
- Devised mathematical tools to estimate the entropy of the networks over development.
- Found that *APOE 4* networks are more unstable over development.
- Authored a journal article accepted for publication in Physical Review E. [paper]

PUBLICATIONS

Teneggi, J., Yi, P.H., Sulam, J. Weakly Supervised Learning Significantly Reduces the Number of Labels Required for Intracranial Hemorrhage Detection on Head CT. arXiv preprint arXiv:2211.15924.

Teneggi, J.*, Bharti, B.*, Romano, Y. and Sulam, J., 2022. From Shapley back to Pearson: Hypothesis Testing via the Shapley Value. arXiv preprint arXiv:2207.07038.

Teneggi, J., Luster, A., and Sulam, J., 2022. Fast Hierarchical Games for Image Explanations. IEEE Transactions on Pattern Analysis and Machine Intelligence. **Best Paper Award at IMLH, ICML 2021.**

Athey, T.L., Teneggi, J., Vogelstein, J.T., Tward, D.J., Mueller, U. and Miller, M.I., 2021. Fitting splines to axonal arbors quantifies relationship between branch order and geometry. Frontiers in Neuroinformatics, p.38.

Teneggi, J., Chen, X., Balu, A., Barrett, C., Grisolia, G., Lucia, U. and Dzakpasu, R., 2021. Entropy estimation within in vitro neural-astrocyte networks as a measure of development instability. Physical Review E, 103(4), p.042412.

ENTREPRENEURSHIP

European Innovation Academy, Turin, Italy 2019

- Developed a gut microbiome company idea to improve maternal health.
- Pitched the idea to a panel of investors and judges.
- Awarded an IP scholarship by Nixon Peabody among the top 10 teams.

Junior Enterprise Torino Politecnico (JEToP), Turin, Italy 2017-2020

- Lead an 100+ people organization as Vice President.
- Developed web and mobile apps for real-world clients for a total of 70+k revenue as Head of IT.
- Won *"Italian Best Project Award 2020"* among 200+ candidate projects.