Victor Ion Butoi

Massachusetts Institute of Technology
vbutoi@mit.edu

RESEARCH INTERESTS

Machine Learning, Model Calibration, Statistics, Computer Vision, Uncertainty Quantification, Medical Imaging, Domain Adaptation.

ACADEMIC BACKGROUND

Massachusetts Institute of Technology — August 2022 - May 2028
Ph.D. Computer Science — *Cambridge, Massachusetts*

Cornell University — Sep 2018 - May 2022
B.Sc. Computer Science — *Ithaca, New York*

- GPA: 3.96/4.3 (*Magna Cum Laude*)

SELECTED PUBLICATIONS

1. UniverSeg: Universal Medical Image Segmentation
   ICCV 2023, *MedNeurIPS* 2022
   Victor Ion Butoi*, Jose Javier* Gonzalez Ortiz, Tianyu Ma, John Guttag, Mert R. Sabuncu, Adrian V. Dalca
2. VoxelPrompt: A Self-Instructed Vision-Language Network for Brain Image Analysis
   In Submission, 2024
   Andrew Hoopes, **Victor Ion Butoi***, John Guttag, Adrian V. Dalca
3. DEUP: Direct Epistemic Uncertainty Prediction
   TLMR 2023
   Moksh Jain*, Salem Lahlou*, Hadi Nekoei, **Victor Ion Butoi**, Paul Bertin, Jarrid Rector-Brooks, Maksym Korablyov, Yoshua Bengio

** denotes equal contribution*

INVITED TALKS

1. Universal Medical Image Segmentation Through In-Context Learning (ML Seminar) *Siemens Healthineers*. June 2024.
2. UniverSeg, a Universal Medical Image Segmentation Model (FoundationalAI Seminar) *GE Healthcare*. Mar 2024.
3. Discussion of UniverSeg, a Universal Medical Image Segmentation Model (Speaker Series) *PathAI*. June 2023.

SERVICE

Reviewer for AutoML2023, ICML2024, ICLR2024, ICLR2025, MIDL2024, NeurIPS2023.

EMPLOYMENT HISTORY

IBM — May 2023 - September 2023
Research Intern — *Cambridge, MA*
Advised by Dr. Leonid Karlinsky & Dr. Rogerio Feris

- Implemented LoRA fine-tuning for several multi-billion parameter Vision-Language Models (Mini-GPT4, InstructBLIP) across a variety of encoder/decoder language backbones (Flan-T5, Vicuna).
- Created a novel training objective involving the relational-expansion of objects in sentences and implemented a standardized evaluation suite across a large set

of visual question answering benchmarks (VL Checklist, ARO, SugarCREPE, CREPE).

ASAPP May 2022 - Sep 2022
Research Intern *New York, NY*
Advised by Dr. Felix Wu & Prof. Kilian Weinberger

- Implemented state-space (S4) models for long sequence classification tasks.
- Devised alternative architecture that improves SOTA performance on Long Range Arena (LRA) while reducing model complexity.

MIT CSAIL, CAML Group May 2021 - May 2022
Research Intern *Cambridge, MA*
Advised by Professor John Guttag & Professor Adrian Dalca

- Developed novel domain-adaption segmentation algorithms utilizing hyper-networks.
- Researched several meta-learning and few-shot algorithms for comparison with proposed method.

Mila - Quebec AI Institute, LambdaZero Team May 2020 - Feb 2021
Research Intern *Quebec, Canada*
Advised by Professor Yoshua Bengio & Professor Pierre-Luc Bacon

- Coded GP regression and MC-Dropout for comparison in uncertainty quantification and data-driven model optimization.
- Implemented message-passing graph neural networks for prediction of molecule binding energy. Achieved 93% ranking accuracy, and ran statistical analysis to demonstrate performance in molecule space.
- Constructed novel molecule vocabularies and coded/bench-marked RL algorithms in molecule generation.

Siemens Healthineers Jun 2019 - Aug 2019
Research Intern *Plainsboro, NJ*
Advised by Dr. Florin Ghesu

- Implemented several machine learning papers in Pytorch, including UNet and Mask-RCNN, for medical segmentation.
- Achieved state of the art 96.5% accuracy for the targeted anatomy and created a system for production.
- Attempted Kaggle's pneumothorax segmentation challenge and altered system to score in top 20th percentile.

Cornell Bailey Hortorium Feb 2019 - Mar 2020
Lab Assistant *Ithaca, NY*
Advised by Professor Kevin Nixon

- Overhauled Cornell's plant specimen file system by constructing a MySQL database and image-processing python scripts.
- Created and maintained a web-server for hosting a very large data-set of plant specimens using Apache.
- Utilized open-cv for a custom bar-code detector that with 90 percent accuracy can detect and isolate an image bar-code, and use this to automatically calibrate resolution of an image.

HONORS AND AWARDS

Massachusetts Institute of Technology
NSF Graduate Research Fellow ***(16% acceptance rate)***

Cornell University
Merrill Presidential Scholar ***(awarded to top 1% of class)***
Tau Beta Pi ***(awarded to top 12.5% of school of engineering)***
Outstanding TA Award ***(awarded to top 10% of TAs)***
Wood Excellence Engineering Research Grant
CIS Dream Grant
Tanner Dean Research Grant
Dean's List (all semesters)
Johnson Controls Foundation Scholarship
Tanner Dean Scholar

TEACHING EXPERIENCE

Advanced Topics in Machine Learning (CS 6784) Dec 2021 - May 2022
Teaching Assistant, Graduate Level
- Instructor: Professor Kilian Weinberger

Introduction to Machine Learning (CS 4780) Sep 2021 - Dec 2021
Head Teaching Assistant
- Instructors: Professor Kilian Weinberger, Anil Damle

OO Programming and Data Structures (CS 2110) Jun 2021 - Aug 2021
Teaching Assistant
- Instructor: Professor Ali Erkan

Introduction to Machine Learning (CS 4780) Jan 2021 - May 2021
Head Teaching Assistant
- Instructor: Professor Thorsten Joachims

Introduction to Machine Learning (CS 4780) Sep 2020 - Dec 2020
Teaching Assistant
- Instructor: Professor Thorsten Joachims

Computer System Organization (CS 3410) Jan 2020 - May 2020
Teaching Assistant
- Instructor: Professor Hakim Weatherspoon

OUTREACH AND LEADERSHIP

GAAP (Graduate Application Assistance Program) Sep 2022 - Present
Mentor *Cambridge, MA*
- Mentor students applying for graduate school from underprivileged backgrounds.

Cornell Data Science May 2021 - May 2022
President *Ithaca, NY*
- Facilitated club operations of 60+ undergraduates pursuing data science projects.

Association for Computer Science Undergraduates Sep 2019 - Sep 2021
Academic Team Chair *Ithaca, NY*
- Twice lead undergraduate research night involving 30+ PhDs and 200+ undergrads.

Inspirit AI May 2021 - Aug 2021
AI Instructor *Remote*
- Taught AI concepts made curriculum and led 30 high-schoolers in AI projects.

APPLICABLE SKILLS

Languages: Python, Java, C/C++, OCaml, SQL, JavaScript, React, Bash, MATLAB
Libraries: Pytorch, Torch Geometric, BoTorch, Keras/Tensorflow, Git, Jupyter, Docker, Weights&Biases

RESEARCH EXPERIENCE

Cornell University Aug 2019 - May 2022
Advised by Professor Adrian Dalca & Professor Mert Sabuncu *Ithaca, NY*

Datasets as Datapoints for Few-Shot Segmentation
- Proposed learning framework for image segmentation in the setting of few-shot learning that allows for segmentation on unseen targets with limited annotations in one forward pass. Aggregated over 40 clinical segmentation datasets and extensively experimented to demonstrate our effectiveness in limited data regimes.

Binary Stochastic Neural Networks
- Assisted in creation of neural-network project where the weights are binary-precision and utilize stochastic Gumbel softmax for more robust predictions. Bench-marked robustness performance of VGG and Resnet based architectures on CIFAR10, TinyImageNet, and Corrupted CIFAR10.

Single Layer Networks
- Created a novel network architecture scheme that utilizes a single set of weights for all layers in a convolutional network. This performs at nearly the same capacity of standard CNNs, as demonstrated on OASIS brain segmentation and registration

LAST UPDATED *November 20th, 2024*