

Marianne Rakic

Personal Website — Google Scholar — GitHub — LinkedIn

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Research: Computer vision and machine learning, with expertise in (language) conditional image generation, stochastic prediction, in-context learning, and generative models.

Published at CVPR (highlight), ECCV, NeurIPS, and in Medical Image Analysis.

Education

PhD, Massachusetts Institute of Technology Cambridge MA, 2020–May 2026

EECS, CSAIL. GPA: 5.0/5.0. Advisors: John V. Gutttag and Adrian V. Dalca.

Thesis: *Learning Possibilities: Stochastic Models for Vision*.

M.Sc., Massachusetts Institute of Technology Cambridge MA, 2020–2022

EECS. GPA: 5.0/5.0. Thesis: *Learning Deformable Templates for Brain MRI*.

M.Sc., Swiss Federal Institute of Technology in Zurich (ETH) Zurich, Switzerland, 2017–2020

Electrical Engineering and Information Technology. GPA: 5.76/6. Master thesis at MIT CSAIL.

B.Sc., University of Liege, Summa cum laude Liege, Belgium, 2014–2017

Engineering (major: Electrical engineering). GPA: 18.57/20

Industry Experience

Research Intern, Microsoft Research (MSR) Cambridge UK, Summer 2024

Created a learning strategy that improves the robustness and open-vocabulary generalization capabilities of foundation segmentation models. Identified critical failure modes in existing models and developed targeted data augmentation pipelines leveraging large language models (GPT-4o).

Applied Scientist Intern, Amazon.com Services, Inc. Seattle WA, Summer 2022

Built a reference-based image generation system using diffusion models through the denoising process. Analyzed limitations when generalizing to complex scenes.

Selected Publications

Marianne Rakic, Zach Berger, Fredo Durand, John Gutttag, Adrian V. Dalca. “From everyday snapshot to professional photos” *In progress*.

A new paradigm for photo enhancement that disentangles image content from aesthetics using flow matching models (FLUX Kontext) and vision-language models (QWEN2.5-VL). Introduces a novel data pairing strategy that enables fine-tuning on substantially more data (LoRA).

Marianne Rakic, Siyu Gai, Etienne Chollet, John Gutttag, Adrian V. Dalca. “Pancakes: Consistent Multi-Protocol Image Segmentation Across Biomedical Domains.” *Neural Information Processing Systems (NeurIPS)* (2025).

First model to predict the different ways (protocols) a group of medical images can be segmented consistently. Proposed a new learning strategy to jointly produce different protocols and designed a new loss function to enforce consistency across multiple images of the same anatomy. Improved efficiency by decoupling the traditional UNet network into a featurizer and a sampler (less memory and faster inference). Outperformed SAM and other SOTA foundation models.

Marianne Rakic, Andrew Hoopes, Malte S. Abulnaga, Mert R. Sabuncu, John V. Gutttag, Adrian V. Dalca. “AtlasMorph: Learning conditional deformable templates for brain MRI.” *Medical Image Analysis* (2025).

AtlasMorph is the first method to learn conditional brain templates jointly with segmentation labels, enabling population-level studies conditioned on subject attributes (e.g., age). Introduced a kernel-based loss that leverages all training data while encouraging unbiased templates, overcoming limitations of prior approaches, and outperforming both classical and learning-based methods.

Marianne Rakic, Jose Javier Gonzalez Ortiz, Hallee Wong, John Gutttag, Adrian V. Dalca. “Tyche: Stochastic In-Context Learning Model for Medical Image Segmentation.” *Conference on Computer Vision and Pattern Recognition (CVPR)* (2024). **Highlight (top ~3%)**.

Tyche is a new in-context learning framework that produces multiple diverse predictions for unseen segmentation tasks from a small example set, capturing rater uncertainty at both training and inference time. Introduces a

novel SetBlock architecture for efficient sampling from distribution modes. Achieves improved performance and faster inference over existing methods.

Hallee Wong, **Marianne Rakic**, John Guttag, Adrian V. Dalca. “ScribblePrompt: Fast and Flexible Interactive Segmentation for Any Medical Image.” *European Conference on Computer Vision (ECCV)* (2024).

ScribblePrompt is an interactive segmentation method that generalizes to unseen medical image structures. Supports clicks, bounding boxes, and scribbles. Outperforms existing interactive segmentation baselines and is preferred by users and speeds up annotation time by 28% while improving performance.

Marianne Rakic, John Guttag, Adrian V. Dalca. “Anatomical Predictions using Subject-Specific Medical Data.” *Medical Imaging with Deep Learning (MIDL)* (2020). Short Paper.

A learning-based method that predicts brain aging trajectories using diffeomorphic registration, producing anatomically plausible evolutions of individual brain anatomy.

Adrian V. Dalca, **Marianne Rakic**, John Guttag, Mert R. Sabuncu. “Learning Conditional Deformable Templates with Convolutional Networks.” *Neural Information Processing Systems (NeurIPS)* (2019).

The first learning-based method to produce medical image templates and the first to condition them on population attributes (e.g., age), enabling attribute-specific population studies and fast template construction.

Professional Service

Area Chair: MIDL (2026), **Top Reviewer:** NeurIPS (2025), MIDL (2025).

Reviewer: CVPR (2026), WiCV at ICCV (2023–2025), MIDL (2023–2024), UQ for CV at ICCV (2023).

Organizing Committee: UNSURE Workshop, MICCAI (2024, 2025).

Honors and Fellowships

Eric and Wendy Schmidt Center (EWSC) PhD Fellowship	2022–2025
Nathaniel Durlach Graduate Fellowship	2020–2021
Entrance Scholarship Fernand PISART	2014

Technical Skills

Methods: Generative models, flow-matching and diffusion models, vision-language models, image editing, in-context learning, uncertainty, image segmentation, deformable registration. Training and fine-tuning large-scale models (LoRA, foundation models), collecting and curating datasets, designing loss functions and new architectures, and building end-to-end ML pipelines.

Tools: Python, PyTorch, vLLM, HuggingFace, pandas, numpy, TensorFlow/Keras, C, MATLAB, L^AT_EX.

Teaching and Mentorship

Head TA: Introduction to Algorithms , MIT	2024
Research Mentorship: Etienne Chollet (Research Engineer, MGH), Elbert Ho (MIT undergraduate student)	
EECS Graduate Application Assistance Program Mentor , MIT	2021–2023
TA: Algebra, Mathematical Analysis I, Mathematical Analysis II , University of Liege	2016–2017
TA: Elements of Probability , University of Liege	2017

Leadership and Activities

European Career Fair Treasurer at European Club , MIT	2022– 2023
President at Graduate Women in Course 6 , MIT	2021
President at Visiting Student Association Board , MIT	2019
Organizing committee at FAIL! Inspiring Resilience at MIT	2019

References

Prof Adrian V. Dalca, MGH, Harvard Medical School, **Prof John V. Guttag**, CSAIL, EECS, MIT.

Languages

French (Native), **English** (fluent), **Spanish** (Intermediate), **German** (advanced beginner).