# **Songlin Jiang**

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# **Current Position**

Research Scientist, Meta AI, Fundamental AI Research (FAIR), New York City 2019 - Present

### **Education**

**Ph.D. in Computer Science**, Carnegie Mellon University (0.00/0.00)

Thesis: Differentiable Optimization-Based Modeling for Machine Learning

Advisor: J. Zico Kolter

B.S. in Computer Science, Virginia Tech (3.99/4.00)

2011 - 2014

# **Previous Positions**

Research Assistant, Carnegie Mellon University (with J. Zico Kolter on ML and optimization)	2016 – 2019
Research Intern, Intel Labs, Santa Clara (with Vladlen Koltun on computer vision)	2018
Research Intern, Google DeepMind, London (with Nando de Freitas and Misha Denil on RL)	2017
Research Assistant, Carnegie Mellon University (with Mahadev Satyanarayanan on mobile systems)	2014 - 2016
Research Intern, Adobe Research, San Jose (with David Tompkins on distributed systems)	2014
Research Assistant, Virginia Tech (with Layne Watson and David Easterling on optimization)	2013 - 2014
Research Assistant, Virginia Tech (with Jules White and Hamilton Turner on mobile systems)	2012 - 2014
Research Assistant, Virginia Tech (with Binoy Ravindran and Alastair Murray on compilers)	2012 - 2014
Software Intern, Snowplow (Scala development)	2013 - 2014
<b>Software Intern</b> , <i>Qualcomm</i> , San Diego (Python and C++ development)	2013
<b>Software Intern</b> , <i>Phoenix Integration</i> , Virginia (C++, C#, and Java development)	2012
Network Administrator Intern, Sunapsys, Virginia	2011

# **Honors & Awards**

NeurIPS Top Reviewer	2022
ICML Outstanding Reviewer	2022
ICLR Outstanding Reviewer	2019
NSF Graduate Research Fellowship	2016 - 2019
Nine undergraduate scholarships	2011 - 2014
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Roanoke County Public Schools Engineering, Salem-Roanoke County Chamber of Commerce, Papa John's, Scottish Rite of Freemasonry, VT Intelligence Community Conter for Academic Excellence, VT Pamplin Leader, VT Benjamin F. Bock, VT Gay B. Shober, VT I. Luck Gravett

# **Publications** [Google Scholar: 0k+ citations and an h-index of 0]

Selected publications are highlighted.

2023

1. Tutorial on amortized optimization [code]

**Brandon Amos** 

Foundations and Trends in Machine Learning 2023

2. On amortizing convex conjugates for optimal transport [code]

**Brandon Amos** 

ICLR 2023

- End-to-End Learning to Warm-Start for Real-Time Quadratic Optimization [code] Rajiv Sambharya, Georgina Hall, Brandon Amos, and Bartolomeo Stellato L4DC 2023
- Meta Optimal Transport [code]
   Brandon Amos, Samuel Cohen, Giulia Luise, and levgen Redko ICML 2023
- Multisample Flow Matching: Straightening Flows with Minibatch Couplings
   Aram-Alexandre Pooladian, Heli Ben-Hamu, Carles Domingo-Enrich, Brandon Amos, Yaron Lipman, and Ricky T. Q. Chen
   ICML 2023
- Semi-Supervised Offline Reinforcement Learning with Action-Free Trajectories Zheng, Qinqing, Henaff, Mikael, Amos, Brandon, and Grover, Aditya ICML 2023
- 7. TaskMet: Task-Driven Metric Learning for Model Learning
  Dishank Bansal, Ricky T. Q. Chen, Mustafa Mukadam, and Brandon Amos
  NeurIPS 2023
- Landscape Surrogate: Learning Decision Losses for Mathematical Optimization Under Partial Information Arman Zharmagambetov, Brandon Amos, Aaron Ferber, Taoan Huang, Bistra Dilkina, and Yuandong Tian NeurIPS 2023
- Koopman Constrained Policy Optimization: A Koopman operator theoretic method for differentiable optimal control in robotics Matthew Retchin, Brandon Amos, Steven Brunton, and Shuran Song ICML Differentiable Almost Everything Workshop 2023
- Neural Optimal Transport with Lagrangian Costs
   Aram-Alexandre Pooladian, Carles Domingo-Enrich, Ricky T. Q. Chen, and Brandon Amos ICML New Frontiers in Learning, Control, and Dynamical Systems Workshop 2023

2022

- 11. Cross-Domain Imitation Learning via Optimal Transport [code]
  Arnaud Fickinger, Samuel Cohen, Stuart Russell, and Brandon Amos
  ICLR 2022
- 12. Matching Normalizing Flows and Probability Paths on Manifolds
  Ben-Hamu\*, Heli, Cohen\*, Samuel, Bose, Joey, **Amos, Brandon**, Grover, Aditya, Nickel, Maximilian,
  Chen, Ricky T. Q., and Lipman, Yaron
  ICML 2022
- Semi-Discrete Normalizing Flows through Differentiable Tessellation Ricky T. Q. Chen, Brandon Amos, and Maximilian Nickel NeurlPS 2022
- 14. Theseus: A Library for Differentiable Nonlinear Optimization [code]
  Pineda, Luis, Fan, Taosha, Monge, Maurizio, Venkataraman, Shobha, Sodhi, Paloma, Chen, Ricky,
  Ortiz, Joseph, DeTone, Daniel, Wang, Austin, Anderson, Stuart, Dong, Jing, Amos, Brandon, and
  Mukadam, Mustafa
  NeurIPS 2022

 Nocturne: a driving benchmark for multi-agent learning [code]
 Vinitsky, Eugene, Lichtlé, Nathan, Yang, Xiaomeng, Amos, Brandon, and Foerster, Jakob NeurIPS Datasets and Benchmarks Track 2022

2021

- 16. On the model-based stochastic value gradient for continuous reinforcement learning [code] [slides] Brandon Amos, Samuel Stanton, Denis Yarats, and Andrew Gordon Wilson L4DC 2021 (Oral)
- 17. Riemannian Convex Potential Maps [code] [slides]
  Cohen\*, Samuel, Amos\*, Brandon, and Lipman, Yaron
  ICML 2021
- Scalable Online Planning via Reinforcement Learning Fine-Tuning Arnaud Fickinger, Hengyuan Hu, Brandon Amos, Stuart Russell, and Noam Brown NeurlPS 2021
- Aligning Time Series on Incomparable Spaces [code] [slides]
   Samuel Cohen, Giulia Luise, Alexander Terenin, Brandon Amos, and Marc Peter Deisenroth AISTATS 2021
- Learning Neural Event Functions for Ordinary Differential Equations [code] Ricky T. Q. Chen, Brandon Amos, and Maximilian Nickel ICLR 2021
- Neural Spatio-Temporal Point Processes [code]
   Ricky T. Q. Chen, Brandon Amos, and Maximilian Nickel ICLR 2021
- Improving Sample Efficiency in Model-Free Reinforcement Learning from Images [code]
   Yarats, Denis, Zhang, Amy, Kostrikov, Ilya, Amos, Brandon, Pineau, Joelle, and Fergus, Rob AAAI 2021
- 23. Neural Fixed-Point Acceleration for Convex Optimization [code] Shobha Venkataraman\* and Brandon Amos\* ICML AutoML Workshop 2021
- 24. Sliced Multi-Marginal Optimal Transport

Samuel Cohen, Alexander Terenin, Yannik Pitcan, **Brandon Amos**, Marc Peter Deisenroth, and K S Sesh Kumar

NeurIPS OTML Workshop 2021

- Input Convex Gradient Networks
   Jack Richter-Powell, Jonathan Lorraine, and Brandon Amos
   NeurlPS OTML Workshop 2021
- 26. Imitation Learning from Pixel Observations for Continuous Control Cohen, Samuel, Amos, Brandon, Deisenroth, Marc Peter, Henaff, Mikael, Vinitsky, Eugene, and Yarats, Denis NeurIPS DeepRL Workshop 2021
- MBRL-Lib: A Modular Library for Model-based Reinforcement Learning [code]
   Pineda, Luis, Amos, Brandon, Zhang, Amy, Lambert, Nathan, and Calandra, Roberto arXiv 2021

2020.....

- 28. The Differentiable Cross-Entropy Method [code] [slides]
  Amos, Brandon and Yarats, Denis
  ICML 2020
- Objective Mismatch in Model-based Reinforcement Learning Lambert, Nathan, Amos, Brandon, Yadan, Omry, and Calandra, Roberto L4DC 2020
- QNSTOP: Quasi-Newton Algorithm for Stochastic Optimization [code]
   Brandon Amos, David Easterling, Layne T. Watson and William Thacker, Brent Castle, and Michael Trosset
   ACM TOMS 2020
- 31. Neural Potts Model

Sercu, Tom, Verkuil, Robert, Meier, Joshua, **Amos, Brandon**, Lin, Zeming, Chen, Caroline, Liu, Jason, LeCun, Yann, and Rives, Alexander MLCB 2020

32. Deep Riemannian Manifold Learning
Lou, Aaron, Nickel, Maximilian, and **Amos, Brandon**NeurlPS Geo4dl Workshop 2020

#### 2019.....

- 33. Differentiable Optimization-Based Modeling for Machine Learning [code]

  Brandon Amos

  Ph.D. Thesis 2019
- 34. Differentiable Convex Optimization Layers [code]
  Agrawal\*, Akshay, Amos\*, Brandon, Barratt\*, Shane, Boyd\*, Stephen, Diamond\*, Steven, and Kolter\*, J. Zico
  NeurIPS 2019
- 35. The Limited Multi-Label Projection Layer [code]

  Brandon Amos, Vladlen Koltun, and J. Zico Kolter
  arXiv 2019
- Generalized Inner Loop Meta-Learning [code]
   Grefenstette, Edward, Amos, Brandon, Yarats, Denis, Htut, Phu Mon, Molchanov, Artem,
   Meier, Franziska, Kiela, Douwe, Cho, Kyunghyun, and Chintala, Soumith
   arXiv 2019

#### 2018.....

- 37. Learning Awareness Models
  Brandon Amos, Laurent Dinh, Serkan Cabi, Thomas Rothörl, Sergio Gómez Colmenarejo,
  Alistair Muldal, Tom Erez, Yuval Tassa, Nando de Freitas, and Misha Denil
  ICLR 2018
- 38. Differentiable MPC for End-to-end Planning and Control [code]

  Amos, Brandon, Rodriguez, Ivan Dario Jimenez, Sacks, Jacob, Boots, Byron, and Kolter, J. Zico NeurIPS 2018

- 39. Depth-Limited Solving for Imperfect-Information Games Brown, Noam, Sandholm, Tuomas, and **Amos, Brandon** NeurIPS 2018
- Enabling Live Video Analytics with a Scalable and Privacy-Aware Framework
  Wang, Junjue, Amos, Brandon, Das, Anupam, Pillai, Padmanabhan, Sadeh, Norman, and
  Satyanarayanan, Mahadev
  ACM TOMM 2018

#### 2017.....

- 41. OptNet: Differentiable Optimization as a Layer in Neural Networks [code] [slides]

  Brandon Amos and J. Zico Kolter
  ICML 2017
- 42. Input Convex Neural Networks [code] [slides]
  Brandon Amos, Lei Xu, and J. Zico Kolter
  ICML 2017
- Task-based End-to-end Model Learning [code]
   Donti, Priya L., Amos, Brandon, and Kolter, J. Zico NeurlPS 2017
- 44. Quasi-Newton Stochastic Optimization Algorithm for Parameter Estimation of a Stochastic Model of the Budding Yeast Cell Cycle Chen, Minghan, Amos, Brandon, Watson, Layne T., Tyson, John, Cao, Yang, Shaffer, Cliff, Trosset, Michael, Oguz, Cihan, and Kakoti, Gisella IEEE/ACM TCBB 2017
- 45. You can teach elephants to dance: agile VM handoff for edge computing
  Ha, Kiryong, Abe, Yoshihisa, Eiszler, Thomas, Chen, Zhuo, Hu, Wenlu, **Amos, Brandon**,
  Upadhyaya, Rohit, Pillai, Padmanabhan, and Satyanarayanan, Mahadev
  SEC 2017
- 46. An Empirical Study of Latency in an Emerging Class of Edge Computing Applications for Wearable Cognitive Assistance

Chen, Zhuo, Hu, Wenlu, Wang, Junjue, Zhao, Siyan, **Amos, Brandon**, Wu, Guanhang, Ha, Kiryong, Elgazzar, Khalid, Pillai, Padmanabhan, Klatzky, Roberta, Siewiorek, Daniel, and Satyanarayanan, Mahadev SEC 2017

47. A Scalable and Privacy-Aware IoT Service for Live Video Analytics [code] Wang, Junjue, **Amos, Brandon**, Das, Anupam, Pillai, Padmanabhan, Sadeh, Norman, and Satyanarayanan, Mahadev ACM MMSys 2017 (Best Paper)

#### 2016

- 48. OpenFace: A general-purpose face recognition library with mobile applications [code] Amos, Brandon, Bartosz Ludwiczuk, and Satyanarayanan, Mahadev CMU 2016
- Collapsed Variational Inference for Sum-Product Networks
   Han Zhao, Tameem Adel, Geoff Gordon, and Brandon Amos
   ICML 2016

50. Quantifying the impact of edge computing on mobile applications
Hu, Wenlu, Gao, Ying, Ha, Kiryong, Wang, Junjue, **Amos, Brandon**, Chen, Zhuo,
Pillai, Padmanabhan, and Satyanarayanan, Mahadev
ACM SIGOPS 2016

51. Privacy mediators: helping IoT cross the chasm
Davies, Nigel, Taft, Nina and Satyanarayanan, Mahadev, and Clinch, Sarah and Amos, Brandon
HotMobile 2016

#### 2015 and earlier...

52. Edge Analytics in the Internet of Things

Mahadev Satyanarayanan, Pieter Simoens, Yu Xiao and Padmanabhan Pillai, Zhuo Chen, Kiryong Ha and Wenlu Hu, and **Brandon Amos** IEEE Pervasive Computing 2015

53. Bad Parts: Are Our Manufacturing Systems at Risk of Silent Cyberattacks?

Turner, Hamilton, White, Jules, Camelio, Jaime A., Williams, Christopher, **Amos, Brandon**, and Parker, Robert

IEEE Security & Privacy 2015

- 54. Early Implementation Experience with Wearable Cognitive Assistance Applications
  Chen, Zhuo, Jiang, Lu, Hu, Wenlu, Ha, Kiryong, **Amos, Brandon**, Pillai, Padmanabhan,
  Hauptmann, Alex, and Satyanarayanan, Mahadev
  WearSys 2015
- 55. The Case for Offload Shaping

Wenlu Hu, **Brandon Amos**, Zhuo Chen, Kiryong Ha and Wolfgang Richter, Padmanabhan Pillai, Benjamin Gilbert and Jan Harkes, and Mahadev Satyanarayanan HotMobile 2015

56. Are Cloudlets Necessary?

Gao, Ying, Hu, Wenlu, **Ha, Kiryong and Amos, Brandon**, and Pillai, Padmanabhan and Satyanarayanan, Mahadev CMU 2015

57. Adaptive VM handoff across cloudlets

Ha, Kiryong, Abe, Yoshihisa, Chen, Zhuo and Hu, Wenlu, **Amos, Brandon**, and Pillai, Padmanabhan and Satyanarayanan, Mahadev CMU 2015

58. Global Parameter Estimation for a Eukaryotic Cell Cycle Model in Systems Biology
Tricity Andrew, **Brandon Amos**, David Easterling, Cihan Oguz and William Baumann, John Tyson,
and Layne T. Watson
SummerSim 2014

Applying machine learning classifiers to dynamic Android malware detection at scale [code]
 Amos, Brandon, Turner, Hamilton, and White, Jules
 IWCMC 2013

# **Open Source Repositories**

28.2k+ GitHub stars across all repositories.

1. facebookresearch/amortized-optimization-tutorial — ★215 — Tutorial on amortized optimization

2. facebookresearch/w2ot — ★39 — Wasserstein-2 optimal transport in JAX

2023 2023

3.	facebookresearch/theseus — $\star 1.5$ k — Differentiable non-linear optimization library	2022
4.	facebookresearch/meta-ot — ★86 — Meta Optimal Transport	2022
5.	bamos/presentations — ★114 — Source for my major presentations	2022
6.	facebookresearch/rcpm — ★66 — Riemannian Convex Potential Maps	2021
7.	facebookresearch/svg — ★54 — Model-based stochastic value gradient	2021
8.	facebookresearch/mbrl-lib — ★858 — Model-based reinforcement learning library	2021
9.	facebookresearch/dcem — ★119 — The Differentiable Cross-Entropy Method	2020
LO.	facebookresearch/higher — ★1.6k — PyTorch higher-order gradient and optimization library	2019
l1.	bamos/thesis — ★304 — Ph.D. Thesis LaTeX source code	2019
L2.	cvxgrp/cvxpylayers — ★1.6k — Differentiable Convex Optimization Layers	2019
L3.	locuslab/Iml — ★57 — The Limited Multi-Label Projection Layer	2019
L4.	locuslab/mpc.pytorch — ★743 — Differentiable PyTorch Model Predictive Control library	2018
L5.	locuslab/differentiable-mpc — ★169 — Differentiable MPC experiments	2018
l6.	locuslab/icnn — ★261 — Input Convex Neural Network experiments	2017
١7.	locuslab/optnet — ★465 — OptNet experiments	2017
l8.	locuslab/qpth — ★614 — Differentiable PyTorch QP solver	2017
L9.	bamos/densenet.pytorch — ★802 — PyTorch DenseNet implementation	2017
20.	bamos/block — ★287 — Intelligent block matrix constructions	2017
21.	bamos/setGPU - *105 - Automatically use the least-loaded GPU	2017
22.	bamos/dcgan-completion.tensorflow — $\star 1.3$ k — Image completion with GANs	2016
23.	cmusatyalab/openface — ★14.8k — Face recognition with deep neural networks	2015
24.	vtopt/qnstop — ★10 — Fortran Quasi-newton stochastic optimization library	2014
25.	bamos/snowglobe — ★27 — Haskell-driven, self-hosted web analytics with minimal configuration	2014
26.	bamos/zsh-history-analysis — ★205 — Analyze and plot your zsh history	2014
27.	bamos/beamer-snippets — ★110 — Beamer and TikZ snippets	2014
28.	bamos/latex-templates — $\star$ 365 — LaTeX templates	2013
<u> 2</u> 9.	cparse/cparse — $\star$ 322 — C++ expression parser using Dijkstra's shunting-yard algorithm	2013
	bamos/cv — ★392 — Source for this CV: Creates LaTeX/Markdown from YAML/BibTeX	2013
31.	bamos/python-scripts — ★197 — Short and fun Python scripts	2013
32.	bamos/reading-list — ★187 — YAML reading list and notes system	2013
33.	bamos/dotfiles — ★235 — ♥ Linux, xmonad, emacs, vim, zsh, tmux	2012

# **Invited Talks**

Slides for my major presentations are open-sourced with a CC-BY license at bamos/presentations.

1.	On optimal control and machine learning, ICML Learning, Control, and Dynamical Systems Workshop	2023
2.	Tutorial on amortized optimization, Brown University	2023
3.	Learning with differentiable and amortized optimization, NYU AI Seminar	2023
4.	Learning with differentiable and amortized optimization, Vanderbilt ML Seminar	2023
5.	Learning with differentiable and amortized optimization, Microsoft Research	2022
6.	Amortized optimization for computing optimal transport maps, Flatiron Workshop	2022
7.	Learning with differentiable and amortized optimization, Cornell AI Seminar	2022
8.	Learning with differentiable and amortized optimization, Cornell Tech Seminar	2022
9.	Learning with differentiable and amortized optimization, Argonne National Laboratory	2022
LO.	Theseus: A library for differentiable nonlinear optimization, NYU	2022
l1.	Theseus: A library for differentiable nonlinear optimization, University of Zurich	2022
L2.	Differentiable optimization-based modeling for machine learning, Colorado Mines AMS Colloquium	2022
L3.	Differentiable optimization, IJCAI Tutorial	2022
L4.	Differentiable optimization for control and RL, ICML Workshop on Decision Awareness in RL	2022
L5.	Differentiable optimization-based modeling for machine learning, CPAIOR Master Class	2022
L6.	Tutorial on amortized optimization, ICCOPT	2022

18. Learning for control with differentiable optimization and ODEs, Columbia University 19. Differentiable optimization-based modeling for machine learning, IBM Research 20. Differentiable optimization for control, Max Planck Institute (Tübingen) 21. Differentiable optimization-based modeling for machine learning, Mila Seminar 22. Deep Declarative Networks, ECCV Tutorial 23. On differentiable optimization for control and vision, CVPR Deep Declarative Networks of the Differentiable optimization-based modeling for machine learning, Caltech CS 159 (Guest Differentiable optimization for learning deep energy models, SIAM MDS Minisymposium of Differentiable optimization-based modeling for machine learning, NYU CILVR Seminar Differentiable optimization-based modeling for machine learning, INFORMS Differentiable optimization-based modeling for machine learning, ISMP 30. Differentiable optimization-based modeling for machine learning, Google Brain Differentiable optimization-based modeling for machine learning, Bosch Center for Al Differentiable optimization-based modeling for machine learning, Tesla Al Differentiable optimization-based modeling for machine learning, NVIDIA Robotics Differentiable optimization-based modeling for machine learning, Salesforce Research Differentiable optimization-based modeling for machine learning, NVIDIA Robotics Differentiable optimization-based model	
38. Differentiable optimization and control, UC Berkeley	2018
Interns and Students	
Anselm Paulus (visiting FAIR from Max Planck Institute, Tübingen) Aram-Alexandre Pooladian (visiting FAIR from NYU) Carles Domingo-Enrich (visiting FAIR from NYU) Sanae Lotfi (visiting FAIR from NYU) Dishank Bansal (AI resident at FAIR) Arnaud Fickinger (visiting FAIR from Berkeley) Aaron Lou (visiting FAIR from Cornell and Stanford) Eugene Vinitsky (visiting FAIR from Berkeley, now incoming professor at NYU) Samuel Cohen (visiting FAIR from UCL, now CEO at FairGen) Ricky Chen (visiting FAIR from Toronto, now scientist at FAIR) Paul Liang (visiting FAIR from CMU) Phillip Wang (at CMU, now CEO at Gather)	2023 – present 2022 – present 2022 – present 2022 – 2023 2022 – 2023 2021 – 2022 2020 – 2022 2021 – 2022 2021 – 2022 2020 2020 2020 2018
Professional Activities	
AAAI Senior Program Committee NeurIPS Area Chair NeurIPS Datasets and Benchmarks Area Chair AAAI Senior Program Committee NeurIPS Learning Meets Combinatorial Optimization Workshop Organizer CVPR Deep Declarative Networks Workshop Organizer ECCV Deep Declarative Networks Tutorial Organizer CMU CSD MS Admissions	2024 2023 2023 2023 2020 2020 2020 2014 – 2015

2022

17. Differentiable optimization for control and RL, Gridmatic

### Reviewing.....

AAAI Conference on Artificial Intelligence

American Controls Conference (ACC)

IEEE Conference on Computer Vision and Pattern Recognition (CVPR)

IEEE Conference on Decision and Control (CDC)

IEEE Control Systems Letters (L-CSS)

IEEE International Conference on Computer Vision (ICCV)

IEEE International Conference on Intelligent Robots and Systems (IROS)

IEEE International Conference on Robotics and Automation (ICRA)

International Conference on the Constraint Programming, AI, and Operations Research (CPAIOR)

International Conference on Learning Representations (ICLR)

International Conference on Machine Learning (ICML)

International Conference on Machine Learning (ICML) SODS Workshop

Journal of Machine Learning Research (JMLR)

Learning for Dynamics and Control (L4DC)

Mathematical Programming Computation (MPC)

Neural Information Processing Systems (NeurIPS)

Neural Information Processing Systems (NeurIPS) Datasets and Benchmarks Track

Neural Information Processing Systems (NeurIPS) OPT Workshop

Neural Information Processing Systems (NeurIPS) DiffCVGP Workshop

Neural Information Processing Systems (NeurIPS) Deep RL Workshop

**Optimization Letters** 

Transactions on Machine Learning Research (TMLR)

# **Teaching**

Graduate AI (CMU 15-780), TA	S2017
Distributed Systems (CMU 15-440/640), TA	S2016
Software Design and Data Structures (VT CS2114), TA	S2013

### **Skills**

Programming C, C++, Fortran, Haskell, Java, Lua, Make, Mathematica, Python, R, Scala

Frameworks JAX, NumPy, Pandas, PyTorch, SciPy, TensorFlow, Torch7 Toolbox Linux, emacs, vim, evil, org, mu4e, xmonad, git, tmux, zsh