MICHAEL (mike) NEUDER

✉ michael.neuder@gmail.com
michaelneuder.github.io
brooklyn, ny

EDUCATION

Harvard University 2020 - 2021
Master of Science, Computational Science and Engineering *Cambridge, MA*

University of Colorado 2015 - 2020
Bachelor of Arts, Computer Science & Bachelor of Arts, Mathematics *Boulder, CO*

University of Oxford 2018
Visiting Student *Oxford, UK*

ACADEMIC EXPERIENCE

EconCS Group, Harvard University August 2019 - August 2021
Research Assistant supervised by Dr. David C. Parkes *Cambridge, MA*

Santa Fe Institute June 2018 - August 2018
Undergraduate Research Fellow: Summer 2018 REU *Santa Fe, NM*

Bradley Lab, University of Colorado April 2017 - August 2021
Research Assistant supervised by Dr. Elizabeth Bradley *Boulder, CO*

Mozer Lab, University of Colorado March 2017 - May 2019
Research Assistant supervised by Dr. Michael Mozer *Boulder, CO*

INDUSTRY EXPERIENCE

The Ethereum Foundation March 2023 - Present
Researcher – Applied Research Group (ARG) *New York, NY*

Google
Software Engineer (L3 → L4) – Cloud Storage August 2020 - March 2021 (*Cambridge, MA*)
Software Engineering Intern – Network Infrastucture Summer 2020 (*remote*)
Software Engineering Intern – Flights Summer 2019 (*Cambridge, MA*)
Software Engineering Intern – Mobile Device Management Fall 2018 (*Sunnyvale, CA*)

Lockheed Martin & LASP[1] Feb 2017 - Oct 2017
Software Engineering Intern *Boulder, CO*

PUBLICATIONS (REVERSE CHRONOLOGICAL)

(1) Zhou Fan, Francisco Marmolejo-Cossio, Daniel Moroz, **Michael Neuder**, Rithvik Rao, and David C. Parkes, "Strategic Liquidity Provision in Uniswap v3," *ACM Conference on Advances in Financial Technologies (AFT) 2023*. https://doi.org/10.4230/LIPIcs.AFT.2023.25.

(2) **M. Neuder**, E. Bradley, E. Dlugokencky, J. W. C. White, J. Garland, "Detection of Local Mixing in Time Series using Permutation Entropy," *Physical Review E 103*, 2021. https://doi.org/10.1103/PhysRevE.103.022217.

(3) **M. Neuder**, D. J. Moroz, R. Rao, D. C. Parkes, "Low-cost attacks on Ethereum 2.0 by sub-1/3 stakeholders," *Workshop on Game Theory in Blockchain, Conference on Web and Internet Economics (WINE) 2020*. https://econcs.pku.edu.cn/wine2020/wine2020/Workshop/GTiB20_paper_8.pdf.

[1] Laboratory of Atmospheric and Space Physics: https://lasp.colorado.edu/home/.

(4) **M. Neuder**, D. J. Moroz, R. Rao, D. C. Parkes, "Defending Against Malicious Reorgs in Tezos Proof-of-Stake," *ACM Conference on Advances in Financial Technologies (AFT) 2020.* https://doi.org/10.1145/3419614.3423265.

(5) **M. Neuder**, D. J. Moroz, R. Rao, D. C. Parkes, "Selfish Behavior in the Tezos Proof-of-Stake Protocol," *Cryptoeconomic Systems (CES) Conference 2020.* https://arxiv.org/pdf/1912.02954.pdf.

(6) J. Garland, T. Jones, **M. Neuder**, J. W. C. White, E. Bradley, "An information-theoretic approach to extracting climate signals from deep polar ice cores," *Chaos: An Interdisciplinary Journal of Nonlinear Science* 29:101105 (2019). https://doi.org/10.1063/1.5127211.

(7) J. Garland, T. Jones, **M. Neuder**, V. Morris, J. W. C. White, E. Bradley, "Anomaly Detection in Paleoclimate Records using Information Theory," *Entropy* 20(12):931 (2018). https://doi.org/10.3390/e20120931.

ACADEMIC TALKS

- **Detection of Local Mixing in Time Series using Permutation Entropy** - 2021 European Geosciences Union General Assembly.
- **Low-cost attacks on Ethereum 2.0 by sub-1/3 stakeholders** - Workshop on Game Theory in Blockchain at the 16^{th} Conference on Web and Internet Economics 2020. video.
- **Defending Against Malicious Reorgs in Tezos** - ACM Advances in Financial Technology 2020. video.
- **Selfish Behavior in the Tezos PoS Protocol** - Crytptoeconomic Systems Conference 2020. video.
- **Animal Tracking using Deep Learning** - Santa Fe Institute 2018. video.

AWARDS

- **2020**. *Computer Science Discovery Learning Award.* Recognizes graduating seniors from the University of Colorado who excelled in academic research.
- **2019-2020**. *Sieglinde Talbott Haller Scholarship in Mathematics.* Given to high performing Math majors at the University of Colorado.
- **2019**. *Honorable Mention: Computing Research Association Outstanding Undergraduate Researcher Award.* Nominated by Dr. Liz Bradley.
- **2017**. *Phi Beta Kappa.* Elected junior year for completing 100 credit hours with a GPA greater than 3.7.
- **2015-2020**. *President Joseph A. Sewall Esteemed Scholar Award.* Merit-based scholarship given to Colorado residents to attend the University of Colorado.
- **2015-2020**. *Dean's List.* Earned for achieving a GPA of 3.75 or greater as a full-time student.

PROFESSIONAL SERVICE

- **2023 & 2024 Columbia CryptoEconomics Workshop (CCE)**. *Organizing Committee.* link.
- **2024 Workshop on Blockchains and Decentralized Finance (EC)**. *Program Committee.* link.
- **2024 The Latest in DeFi Research (TLDR) Confrerence**. *Program Committee.* link.
- **2024 Crypto Academic Summer School at Edge City**. *Organizing Committee.* link.
- **2023 dYdX MEV Committee**. *Member.* link.

BLOCKCHAIN ARTICLES (NON-PEER REVIEWED) (BY TOPIC)

Proof-of-Stake

Ethereum Consensus

Issuance Issues – Subsequent Soliloquy. link.
Issuance Issues – Initial Issue. link.
Concurrent Block Proposers in Ethereum. link.
Rollup-Centric Roadmap (2024 version) (mike+stokes version) (From The Vault) link.
A set-theoretic view of Ethereum coteries. link.
Time, slots, and the ordering of events in Ethereum Proof-of-Stake link.

EIP-7251 (link); Increase the `MAX_EFFECTIVE_BALANCE`

Increase the MAX_EFFECTIVE_BALANCE a modest proposal. link.

FAQ on EIP-7251; Increasing the MAX_EFFECTIVE_BALANCE. link.
Slashing penalty analysis; EIP-7251. link.
Validator consolidation in EIP-7251. link.

EIP-7547 (link); Inclusion Lists

No free lunch a new inclusion list design. link.
Resistance is not futile; CR in mev-boost. link.
Unconditional inclusion lists. link.
Inclusion lists: execution, consensus, & engine spec overview. link.
Inclusion Lists PoC Specification. link.
The Case for ILECTRA. link.

Liquid staking & restaking

Musings on "two-tiered" staking, a native Liquid Staking Token design.. link.
Magnitude and direction of Lido attack vectors . link.
The Risks of LRTs. link.

Maximal Extractable Value (MEV)

Relays

Optimistic Relay Proposal. link.
Towards enshrined PBS an optimistic roadmap. link.
An optimistic weekend. link.
Optimistic relays and where to find them. link.
Bid cancellations considered harmful. link.

Enshrined Proposer-Builder Separation (ePBS)

Equivocation attacks in mev-boost and ePBS. link.
Why enshrine Proposer-Builder Separation? A viable path to ePBS. link.
Payload-timeliness committee (PTC) an ePBS design. link.
ePBS the infinite buffet. link.
Relays in a post-ePBS world. link.
Consider the ePBS. link.

Miscellanea

Dr. Changestuff or: how i learned to stop worrying and love mev-burn. link.
Timing Games: Implications and Possible Mitigations. link.
Execution Tickets. link.

BLOCKCHAIN PRESENTATIONS, PANELS, & PODCASTS

Presentations

LSTs and LRTs: Is restaking the new staking? – CBER Forum Annual Conference. slides.
State of the Ethereum Union (1/N perspective) – ETHBoston. slides.
No Free Lunch, an inclusion list design – Columbia CryptoEconomics Working Session. recording. slides.
Why it's hard to enshrine PBS – Archetype MEV Lunch. recording. slides.
Why it's hard to enshrine PBS – Columbia Center for Digital Finance and Technologies. slides.
Reorgs in PoS and multi-agent selfish mining – MEV Roast; Reorg Edition. recording. slides.

ETHDenver (March 2024)

Execution Tickets – Beyond the Block (Titan Builder & Hashkey Capital). recording. slides.
The Risks of LRTs – Research Day (SevenX Ventures). recording. slides.

DevConnect (November 2023)

Increase the MAX_EFFECTIVE_BALANCE – EthStaker Staking Gathering. recording. slides.
A set theoretic view of Ethereum coteries – LidoConnect. recording. slides.

EthCC (Community Conference) (July 2023)

Towards Enshrined Proposer-Builder Separation – EthCC main event. recording. slides.
Ethereum PBS R&D Roadmap – Modular Summit. recording. slides.

Increase the MAX_EFFECTIVE_BALANCE – Kiln Rendez-vous. recording. slides.

Panels

Decentralization Panel – Espresson Beyond the Baselayer. March 2024. recording.
Decentralize or Bust – bloXroute & ETHStaker. March 2024. recording.
Alignment Panel – EignenLayer Restaking Summit. November 2023. recording.
PBS & Beyond – MEVDay Paris. July 2023. recording.

Podcasts

ETH Insights: Discussing MaxEB – Coinbase Webinar. April 2024. recording. article.
PeepAnEIP:EIP-7547– Ethereum Cat Herders. April 2024. recording.
Endgame 2.0: A Guide to Vitaliks Ethereum Roadmap – Bankless. February 2024. recording.
Were Pretty Sure Mike and Max Can Fix MEV – The Gwart Show. February 2024. recording.
PeepAnEIP: EIP-7251 – Ethereum Cat Herders. February 2024. recording.
Eigenlayer In 2024 With CEO Sreeram Kannan (co-host) – Bankless. December 2023. recording.
An Incomplete Guide to PBS – Uncommon Core 2. September 2023. recording.

OPEN SOURCE CONTRIBUTIONS

EIP-7547: Inclusion Lists (`python`)
- *EIP (Ethereum Improvement Proposal).*
- *Spec Overview (Consensus, Execution, and Engine API specifications).*
- *Proof-of-Concept Specification.*
- *Compilation of Related Work.*

EIP-7251: Increase the `MAX_EFFECTIVE_BALANCE` (`python`)
- *EIP (Ethereum Improvement Proposal).*
- *Minimal Spec Change (Consensus specifications).*
- *Compilation of Related Work.*

MEV-boost Relay: Optimistic Processing (`golang`)
- *Main pull requests & design documentation: First, Second, Third (final & merged).*
- *Header-only parsing optimization.*
- *Pull request list.*
- *Proposal.*
- *Builder Onboarding.*

Erigon (Ethereum Execution Layer Client) (`golang`)
- *Refactored req/resp domain network encoding.*
- *Consensus spec implementation.*
- *Pull request list.*

Prysm (Ethereum Consensus Layer Client) (`golang`)
- *Keymanager code-health refactor.*
- *Pull request list.*

STRUMPACK (High-performance matrix math package) (`C++`)
- *Mixed-precision (`float64` & `float32`) iterative refinement.*
- *Pull request list.*
- *Write-up.*

OptRBC (Optimal solutions in 2D Rayleigh-Benard Convection.) (`FORTAN`)
- *Multiprocessor implementation using openmp.*
- *Write-up.*

Image quality convolutional neural networks. (`python`)
- *Write-up.*
- *Example network.*

MISCELLANEA: FUN WRITING & SOFTWARE

Writing

Tattoo probabilistic analysis.
Solo-staking rig.
NBA draft probabilistic analysis.
Shakespeare Zipf-ian analysis.

Software

Monte Carlo numerical demonstrations. (`python`)
Connect Four PyQT application. (`python`)
Terminal implementation of popular games. (`perl`)
Rubik's cube solver. (`C++`)