

# Sean C. Borneman

Bloomington High School South  
SAT superscore: 1520 (750V, 770M)  
GPA 4.4 (weighted)

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Github: <https://github.com/SB510>

## OBJECTIVE

To contribute to theoretical and applied research in quantum information processing using my modeling and hardware programming skills in a results-oriented research group.

## ACADEMIC SUBJECT LEVELS

- Completed: AP Calculus AB (grade: A), Chemistry (grade: A), Biology (grade: A)
- Currently in: AP Calculus BC (grade: A), Physics 1C (grade: A), AP Chemistry (grade: A)

## SCHOLARSHIPS/FELLOWSHIPS

- NASA Merit Fellowship for weeklong Space Camp (2019)

## PROJECT PORTFOLIO

(code and presentation examples available at <https://github.com/SB510>)

- Quantum Annealing of the Asymmetric Traveling Salesman problem (2022-23)
- EEG Response to Dynamic Visual Signal: Machine Learning Detects Predictive Processing (2021-22)
- Machine Learning for Social Distancing: an Arduino-based Human Voice and Distance Detector (2021)
- Measuring Air Pollution Using a Homemade Optical Scatterometer (2020)
- Radiation Shielding: Analysis of Material Density vs. Effectiveness (2019)

## Technical Skills

- Programming, proficient in: Python (TensorFlow, sklearn, Qiskit), Java, Matlab, C#
- Scripting: LaTeX (Overleaf)

## HONORS AND AWARDS (selected, state-level and above)

### Science Fair

- ISEF international finalist, Computational Biology and Bioinformatics category, Atlanta, GA (2022)
- 1st place in 9th grade, Hoosier State Science Fair, IN (2022)
- Top 300 Broadcom MASTERS national science fair, USA (2021)
- Top Junior Scientist, Hoosier State Science Fair, IN (2021)
- 1st place in 8th grade, Hoosier State Science Fair, IN (2021)
- 2nd place in 7th grade, Hoosier State Science Fair (2020)
- 1st place, 36th Team Crane Science and Engineering Fair (2020)
- 1st place in Physics, Junior Division, 35th Team Crane Science and Engineering Fair (2019)

### Robotics

- *FIRST Dean's List* Semi-finalist (2023)
- First Tech Challenge, team 11329 I.C.E. Robotics, score ranking: 1<sup>st</sup> in state, 2<sup>nd</sup> in the world (2023)
- First Robotics Competition, team 3494, programming co-lead – *Innovation in Control* award; Tippecanoe Regional; *Autonomous* award; District Kokomo (2022)
- First Tech Challenge, team 11329, programming lead – *Connect* award, *Finalist Alliance Captain*; Indiana State Championship; *1st place INSPIRE* award; *Winning Alliance Captain*; South League Tournament (2022)

## PUBLICATIONS

1. Malaia, E.A., **Borneman, S.C.**, Krebs, J., Wilbur, R.B. (2021). Low-frequency entrainment to visual motion underlies sign language comprehension. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 29, 2456-2463. doi:10.1109/TNSRE.2021.3127724
2. **Borneman, S.C.**, Krebs, J., Wilbur, R. B., Malaia, E. A. (2021) Application of machine learning to signal entrainment identifies predictive processing in sign language. *Proceedings of the 43rd Annual Meeting of the Cognitive Science Society*, p. 326-329. <https://escholarship.org/uc/item/4gr9g2p7>
3. Malaia, E.A., Ford, K., **Borneman, S.C.**, Krebs, J., Ames, B. Salience of low-frequency entrainment to visual signal for classification points to predictive processing in sign language. 30th Annual Computational Neuroscience Meeting: CNS\*2021–Meeting Abstracts. *Journal of Computational Neuroscience* 49, 3–208 (2021). DOI: 10.1007/s10827-021-00801-9

## CONFERENCES as presenter or co-presenter

1. **Borneman, S.C.**, Malaia, E.A., Krebs, J., Wilbur, R.B. Language comprehension: explainable AI identifies predictive processing in EEG. Poster presented at *Organization for Human Brain Mapping (OHBM)* conference 2022, Glasgow, Scotland, UK (June 19-23, 2022)
2. Malaia, E.A., Krebs, J., **Borneman, S.C.**, Wilbur, R.B. (Sept. 23-24, 2021) To understand is to predict: machine learning identifies low-frequency entrainment to visual stimuli. Poster presented at *Computational Cognition 2021*, University of Osnabrück, Germany (virtual)
3. Malaia, E.A., Ford, K., **Borneman, S.C.**, Krebs, J., Ames, B. (July 4-6, 2021) Salience of low-frequency entrainment to visual signal for classification points to predictive processing in sign language. Featured oral presentation at *Computational Neuroscience Conference 2021* (virtual)

## RELEVANT EXTRACURRICULAR COURSEWORK

### Mathematics

**Introduction to Number Theory (with LaTeX)**

April – June 2020

Art of Problem Solving

### Programming

**Java programming: CS00b/CS01a**

June 2021 – August 2021

KTByte Computer Science Academy

**Neuroscience with MATLAB**

January – April 2021

Institute for Educational Advancement Academy

**Arduino® Prototyping**

October – December 2020

Johns Hopkins Center for Talented Youth

**Introduction to Python**

January – April 2020

Johns Hopkins Center for Talented Youth

## SERVICE TO RESEARCH COMMUNITY

- Open science: GUI interface for machine learning algorithm application to human subject data with iterative parameter optimization ([github.com/SB510/MLUI](https://github.com/SB510/MLUI))
- Mentored an NSF REU college undergraduate student in research programming; University of Alabama, *REU Engineering Sensors, Systems, and Signal Processing for Speech Pathology* (June-July 2022)
- Young reviewer, Inaugural issue of *Frontiers in Neuroscience for Young Minds*: Anaya and Bavelier, D. (2013) Ever Wondered What Playing Video Games Does to Your Brain? *Front. Young Minds*. 1:15. doi: 10.3389/frym.2013.00015