

Mathematician Monday:

John Urschel



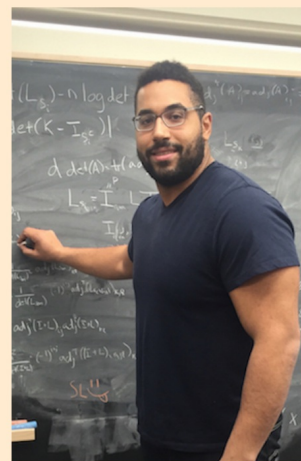
Urschel was born in [Winnipeg, Manitoba](#), Canada. His parents, John Urschel and Venita Parker, were a surgeon and an attorney respectively. He earned a bachelor's and master's in mathematics at [Pennsylvania State University](#). While at Penn State, he was awarded the [William V. Campbell Trophy](#), known as the "academic Heisman".

Mathematician Monday:

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Appointments

Doctoral Candidate, Applied Mathematics, MIT
Adjunct Research Associate, Mathematics, Penn State



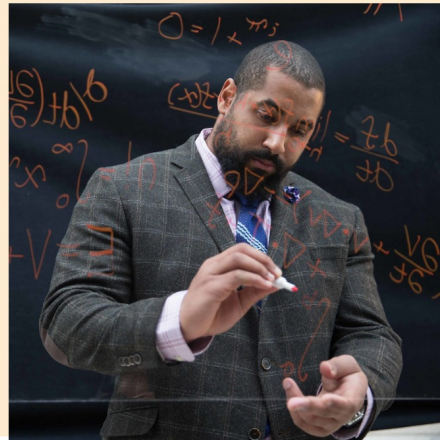
In 2015, Urschel co-authored a paper in the *Journal of Computational Mathematics*^[13] titled "A Cascadic Multigrid Algorithm for Computing the Fiedler Vector of Graph Laplacians". It includes "a cascadic multigrid algorithm for fast computation of the Fiedler vector of a graph Laplacian, namely, the eigenvector corresponding to the second smallest eigenvalue."^[14]

Urschel began a Ph.D. in mathematics at MIT in 2016,^[15] focusing on spectral graph theory, numerical linear algebra, and machine learning.^[16] On January 4, 2017, Urschel was named to Forbes' "30 under 30" list of outstanding young scientists. His Forbes biography states "Urschel has published six peer-reviewed mathematics papers to date and has three more ready for review. That's a respectable publication history for someone who only started pursuing their PhD at MIT this year. He's won academic awards for his math prowess. All this while playing guard for the Baltimore Ravens."^{[17][18]}

As of 2017, Urschel has an Erdős number of 4.^[19]

Mathematician Monday:

John Urschel
In his own words...



I have done research in a number of areas, including combinatorial optimization, computational finance, graph theory, machine learning, mathematical physics, numerical PDEs, and others.

Right now, I spend most of my time thinking about graph theory, machine learning, and numerical analysis.

Mathematician Monday:

John Urschel In his own words...



Thank you to everyone for the kind words today. It wasn't an easy decision, but I believe it was the right one for me. There's no big story here, and I'd appreciate the right to privacy.

I'm extremely grateful to the Ravens, and blessed to have been able to play the game I love at the highest level. It is a great game. There are some games — like the playoff game at Pittsburgh — that I will never forget.

I'm excited to start working on my doctorate in mathematics full time at MIT. I'm looking forward to the chance to take courses that are only offered in the fall semester, while spending time with my fiancé and preparing myself for the new challenges that will come with fatherhood. We're expecting our first child in December.



John Urschel ✓
@JohnCUrschel

1:33 PM - Jul 27, 2017

483 1,748 8,216

Urschel's decision came two days after the [release of a study](#) in which all but one of 111 brains of former N.F.L. players showed signs of chronic traumatic encephalopathy, a degenerative brain disease linked to repeated hits to the head.

Mathematician Monday:

John Urschel

Numerical linear algebra

Numerical linear algebra is the study of [algorithms](#) for performing [linear algebra](#) computations, most notably [matrix](#) operations, on [computers](#). It is often a fundamental part of engineering and computational science problems, such as [image and signal processing](#), [telecommunication](#), [computational finance](#), [materials science](#) simulations, [structural biology](#), [data mining](#), [bioinformatics](#), [fluid dynamics](#), and many other areas. Such software relies heavily on the development, analysis, and implementation of state-of-the-art algorithms for solving various numerical linear algebra problems, in large part because of the role of matrices in [finite difference](#) and [finite element methods](#).

"...most notably matrix operations..."

$$\begin{array}{c} \mathbf{D} \quad * \quad \mathbf{A} \quad = \quad \mathbf{C} \\ \left[\begin{array}{ccc} 2 & 1 & 3 \\ -2 & 2 & 1 \end{array} \right] * \left[\begin{array}{cc} 2 & 1 \\ 3 & 2 \\ -2 & 2 \end{array} \right] = \left[\begin{array}{cc} 1 & 10 \\ 0 & 4 \end{array} \right] \\ (2,3) \quad (3,2) \quad (2,2) \end{array}$$

Mathematician Monday:

John Urschel Machine learning

Machine learning is a field of [computer science](#) that gives [computers](#) the ability to learn without being explicitly programmed.^[1]

[Arthur Samuel](#), an American pioneer in the field of [computer gaming](#) and artificial intelligence, coined the term "Machine Learning" in 1959 while at [IBM](#)^[2]. Evolved from the study of [pattern recognition](#) and [computational learning theory](#) in [artificial intelligence](#),^[3] machine learning explores the study and construction of [algorithms](#) that can learn from and make predictions on [data](#)^[4] – such algorithms overcome following strictly static [program instructions](#) by making data-driven predictions or decisions,^{[5]:2} through building a [model](#) from sample inputs.

