



## The Faulty GPS Problem: Optimal Search for Home Node on a Network, with Unreliable Directions

**Speaker: Steve Alpern, Professor  
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**Tuesday, April 4<sup>th</sup>, 2023  
11:00 AM – 12:00 PM  
Location: EEB 132**

Zoom: <https://usc.zoom.us/j/96085498483?pwd=aXJ4U244VHhQOCtIUURDM29mb216UT09>  
Meeting ID: 960 8549 8483  
Passcode: 955910

**Abstract:** A Searcher wants to find the Home node on a given Network, but his directions are unreliable. At every branch node of a network  $Q$ , a Satnav (GPS) points to the arc leading to the destination, or home node,  $H$  - but only with a high known probability  $p$ . The pointer is fixed in time, so does not change when a node is revisited. Always trusting the Satnav's suggestion may lead to an infinite cycle. If one wishes to reach  $H$  in least expected time, with what probability  $q=q(Q,p)$  should one trust the pointer (if not, one chooses randomly among the other arcs)? We call this the Faulty Satnav (GPS) Problem. We also consider versions where the trust probability  $q$  can depend on the degree of the current node and a 'treasure hunt' where two searchers try to reach  $H$  first. The agent searching for  $H$  need not be a car, that is just a familiar example -- it could equally be a UAV receiving unreliable GPS information.

This problem has its origin not in driver frustration but in the work of Fonio et al (2017) on ant navigation, where the pointers correspond to pheromone markers pointing to the nest.

**Bio:** Steve did his AB in Mathematics at Princeton, supervised by Oskar Morgenstern, and his PhD in Ergodic Theory at Courant Institute – NYU, under Peter Lax. He moved from ergodic theory to game theory and search theory mid career. After many years at the London School of Economics, he moved to the University of Warwick, where he is Professor of Operational Research.

**Hosts:** Dr. Petros Ioannou, [ioannou@usc.edu](mailto:ioannou@usc.edu) and Dr. George Papavassilopoulos, [yorgos@netmode.ece.ntua.gr](mailto:yorgos@netmode.ece.ntua.gr)