

Harvard University

MARTIN A. NOWAK, Ph.D.  
*Faculty Director*

8 January 2019

***RE: Letter of Strongest Recommendation for Dr. Andreas Pavlogiannis***

Dear Appointments Committee,

It is my pleasure to enthusiastically support the application of **Andreas Pavlogiannis** for Assistant Professor in Computing Systems and Security at the University of California - Irvine.. I have known Andreas for several years and have worked with him on multiple fascinating projects, and am happy to add my strong recommendation to his application.

Andreas' primary research area is the algorithmic study of problems in program analysis and computer-aided-verification. He has a truly impressive collection of results, most of which have been published in top venues, including POPL (3 papers), CAV (1 paper), RTSS (1 paper), among others.

In addition to his work in computer science, Andreas has produced a remarkable set of results in the field of evolutionary dynamics. First, he worked on the problem of understanding how long an evolutionary search requires for the discovery of new biological functions, bringing the question of time-scales from computer science to biology. He showed that several classical evolutionary processes take exponential time, and described a natural process that breaks this exponential barrier. The results of this work were published in *PLoS Computational Biology*.

Andreas also worked on the evolution of cooperation in spatial structures. A shift-update rule worked very well in one-dimensional structures, but all previous efforts to extend it in two dimensions had failed. Andreas showed how a very intuitive application of shortest paths suffices for extending shift-updating to two-dimensional structures. This work has important implications in understanding cellular cooperation for tissue formation, and was published in *Nature Scientific Reports*.

Finally, Andreas has recently produced some surprising results in evolutionary graph theory. Amplifiers of natural selection are population structures that increase the fixation probability of new mutants as compared to well-mixed population. Very few strong amplifiers had been known for mutants arising spontaneously, and none were known for mutants arising during reproduction. Andreas proved, completely unexpectedly, that almost all population structures can be made strong amplifiers, for both types of mutants, by adding suitable weights. In contrast, he showed that without weights, strong amplification is impossible when mutants arise during reproduction. A manuscript is currently under preparation, and such strong and novel results deserve publication at a top journal of the field.

Andreas has been the main contributor in all the above papers. He has demonstrated maturity in choosing fruitful research questions independently, along with great technical skills in obtaining exciting new results.

It is an honor to recommend Andreas with the utmost enthusiasm. I am confident that he will be an excellent addition to your institution.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Martin A. Nowak". The signature is fluid and cursive, with the first name "Martin" and last name "Nowak" clearly distinguishable.

Martin A. Nowak  
Professor, Mathematics