Name(s)

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Project Number

S0414

Project Title

The Development and Study of an Algorithm to Explain Successful Language Acquisition from an Inconsistent Source

Abstract

Objectives/Goals

This project presents a new algorithm to model and investigate the learning process of a learner mastering a set of grammatical rules from an inconsistent source. The compelling interest of human language acquisition is that the learning succeeds in virtually every case, despite the fact that the input data are formally inadequate to explain the success of learning. This outcome has been used by some scientists to say that language learners have some sort of innate feeling of grammar. However, I present a novel mathematical model that explains how a learner can successfully learn from or even surpass its imperfect sources without possessing any form of innate biases or constraints about the types of patterns that exist in the language.

Methods/Materials

In this project, I conducted a thorough analytical study of the algorithm using the apparatus of Markov chains and and also a numerical study by writing several Fortran computer codes.

Results

I proved two theorems, rigorously establishing the boosting effect in the case with two variants. The numerical simulation showed that the boosting effect also occurs in the case with multiple variants. The numerical study of convergence of the algorithm revealed several patterns of dependence of the boosting effects on various parameters.

Conclusions/Discussion

Both the analytical and the numerical results showed that the algorithm possesses a source-boosting property, and thus it is possible for a learner to surpass its inconsistent source without an innate sense of grammar.

Summary Statement

In this project, I developed a mathematical model to show that a learner can learn from or even surpass its inconsistent source without any innate sense of grammar.

Help Received

Professor N. Komarova (UCI) provided feedback and conceptual guidance at several stages of my work. My chemistry teacher, Mr. Smay, read over and edited the final report. However, all of my research and report was ultimately done solely by me.