The Symbolic Systems Program at Stanford University

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Program Description

Symbolic Systems is an interdepartmental program at Stanford that offers an undergraduate major leading to the Bachelor of Science in Symbolic Systems, and also supports a special track in Philosophy and Symbolic Systems for Ph.D. students in philosophy. This poster focuses on the undergraduate program.

Approximately 33 undergraduates (figure from autumn 1993) are enrolled in the symbolic systems major. Each student is required to complete a core of thirteen courses drawn primarily from computer science, philosophy, linguistics, and psychology. This core consists of the following courses:

> Introduction to Cognitive Psychology
> Computer Programming Methodology/Abstractions
> Introduction to Computer Science (2 quarters)
> Introduction to Artificial Intelligence
> Mind, Matter, and Meaning (intensive writing
>   course in philosophy)
> Philosophy of Language, or of Mind
> Introduction to Syntax
> Semantics and Pragmatics
> First Order Logic

A course on computability, automata, formal languages and complexity
A post-calculus mathematics course
The Senior Seminar in Symbolic Systems

In addition to the core curriculum, students take at least five courses in an area of concentration of their choosing. A student may design his/her own concentration, or select from the following suggested ones:

Applied Logic
Artificial Intelligence
Cognition
Computation
Education and Learning
Human-Computer Interaction
Natural Language
Neuroscience
Philosophical Foundations

The most popular concentrations presently are human-computer interaction, artificial intelligence, and the individually-designed option. The latter caters to students with specialized interests (e.g. "computer music") or who wish to combine one or more of the above areas (e.g. "AI and neuroscience"). Areas that may be added to the

list of suggested concentrations in the future include (1) robotics and (2) computers and social science/public policy.

All students are encouraged to do directed research, either assisting faculty or pursuing independent projects. The program supports several options for its undergraduates, including paid summer internships with affiliated faculty at Stanford and nearby research organizations, credit for work on independent projects, and the senior honors thesis.

Program Goals and Philosophy

The Symbolic Systems Program is built around the idea that the notions of symbol, representation, information, and action form a common core that arises in a variety of fields of study and application. Its goal is "to prepare students with the vocabulary, theoretical background, and technical skills to understand and participate in contemporary interdisciplinary research into questions about language, information, and intelligence — both human and machine."

The core around which symbolic systems is built emphasizes formal techniques, theories, and analysis, in part as a result of an unusual concentration of talent in these areas within the Stanford faculty, and at local research institutions such as the Center for the Study of Language and Information, SRI, Xerox PARC, Teleos, and the Institute for Research on Learning. But the approach of (a) a common core of courses and (b) many possible paths for concentrated study (see FIGURE), has proven, since the founding of the program in the mid-1980s, to be quite flexible at accommodating the changing interests of students. The core courses provide students with technical background that would be difficult for them to acquire on

their own, while the various concentrations and options for directed research allow students to begin to define their own paths into uncharted territories.

What most students in the Symbolic Systems Program share is an interest in language and information. Perhaps more interested in the human side of computing than would be a typical computer science major, and more interested in technology than many psychology, philosophy, and linguistics majors, students in symbolic systems often find the program to be a good blend of humanistic and technical education. It may be a good home for a student whose interests do not quite fit within a single discipline, or it can be a good place to begin when a student's interests are still somewhat undefined.

Undergraduates who complete the degree in symbolic systems typically want to be involved at the cutting edge of the cognitive and information sciences. For some, this will mean going on to graduate school for more interdisciplinary study of language and information, or in any of the contributing disciplines. For others, it will mean going into industry, applying what they have learned to designing user software or assisting in the human side of product development. And of course many other career paths are possible, some of which will stray quite far from

symbolic systems.