Statement of Purpose

Graduate Application to Carnegie-Mellon University

Department of Computer Science

Kai-Fu Lee

In my undergraduate years at Columbia, **Artificial Intelligence** has dominated my curriculum. I hope to continue this trend in post-graduate studies. After receiving my degree, I would like to be involved in the research and development of this new science.

Having taken **six** graduate level A.I. courses (Natural Language Processing, N.L.P. Seminar, N.L.P. Independent Project, Vision, DADO Independent Project, and Artificial Intelligence), I feel that I am well prepared for the challenge of doing graduate research in A.I.. I believe my performance in these, as well as other classes, will demonstrate my ability.

There is no better way to gain a clearer understanding of the material than teaching it. Since my sophomore year in college, I have been hired by the Columbia University Computer Science Department as a **teaching assistant**. In the five semesters that followed, I assisted in the following classes:

Spring 1981	**E1801**	- *Introduction to Computer Science*
Fall 1981	**W3203**	- *Discrete Mathematics*
Spring 1982	**W4705**	- *Natural Language Processing*
Fall 1982	**W4701**	- *Artificial Intelligence*
Spring 1983	**W4705**	- *Natural Language Processing*

From teaching a wide range of students, from inexperienced to brilliant, from freshmen to doctoral candidates, from housewives to professors, I have gained experience, knowledge, as well as patience.

I have been actively involved in many projects in computer science. In Fall '81, I completed an independent project with Professor Michael Lebowitz in natural language processing. This project, nicknamed McLebowitz and written in TLISP, involved the design and implementation of a **natural language computer-aided instruction program** that taught Conceptual Dependency. It was also capable of conducting a simple conversation with the user in English. The techniques used included various aspects of N.L.P., including parsing, generation, memory simulation (storage and retrieval, long term and short term), inferences, and question answering.

In Fall '82, I completed another independent project with Professor Salvatore Stolfo. As a member of the DADO (A parallel tree-structured machine designed to provide significant performance improvements in the execution of A.I. software, particularly production systems) Research Group, I was in charge of implementing a **compiler** in MACLISP that translated LISP code and LISP-dependent DADO instructions into actual DADO instructions run under PL/M.

As a class project for Professor John Kender's COMSE6998 (Vision), I implemented a system of many programs (in SAIL) dealing with **Moving Light Displays** as an effort to duplicate and amend the study done at the University of Rochester [Rashid, 1979]. In this version, (1) Frames of moving objects(s) were generated using velocity, point, and angle information provided by the user. (2) Inter-Frame correspondences were made to correlate one point in one frame to the next. Both exhaustive and heuristic algorithms were used. (3) A minimum spanning tree is generated for each frame using the correspondences. (4) Each tree is divided into clusters of trees when there seems to be more than one object in the picture. Thus, from simple point data, the program is able to determine the correlation between frames, the number of objects, and the likely connections of each object.

These projects exposed me to three major fields, namely, natural language processing, production (expert) systems, and vision. Listings, exections, and papers on these projects are available upon request. All three fields are extremely challenging and each with much to explore.

Another course, Parallel Architechture and VLSI Design, provided the **methodology** to aid the exploration of them. The greatest problem with any field in AI is combinatorial explosion. By processing in parallel, this could be reduced drastically (From N to log N). For this course, I wrote a **simulator** (in MACLISP) for NON-VON II, the tree-structured parallel Supercomputer.

Artificial Intelligence is the elucidation of human learning process, the quantification of human thinking process, the explication of human behavior, and the understanding of what makes intelligence possible. It is men's final step to understand themselves, and I hope to take part in this new, but most promising science.