

MIT Dept. of Brain & Cognitive Sciences  
CSAIL  
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14 February 2012

To: Faculty Search Committee

I am pleased to write in support of Lavanya Sharan's application for the tenure track position of Assistant Professor. I am a Principal Research Scientist in the department of Brain & Cognitive Sciences, essentially the research faculty equivalent of an assistant or associate professor without tenure. I am also a member of CSAIL. Prior to this, I was a member of research staff at Xerox's Palo Alto Research Center. My background is in computer vision, and I now do primarily computational modeling of human vision for applications.

I have known Lavanya since she came to MIT in September 2003; we have done research and written papers together. Lavanya helped Ted Adelson and I write two grant proposals. Recently, these proposals – an NIH R21 and R01 – have been funded. It was quite enjoyable to have Lavanya on the grant-writing team; she was organized, productive, and thoughtful. The R01, I believe, was intended in part to fund Lavanya as a post-doc, but due in part to delays in us hearing back about the success of the grants, she chose instead to take a post-doc at Disney Research. At Disney, she has been using behavioral and computational techniques to study perception of human figures.

During graduate school, Lavanya worked on the problem of material perception – how do we judge how shiny a material is? Whether it is a light or dark material? How rough it would feel? Whether it is plastic or glass? These are very hard problems, very little has been done on them, and I think it's fair to say that no one knows how to solve them. Prior to Lavanya's work, little was known even about human material perception abilities. The problem is made difficult and interesting by the general lack of lay vocabulary for material properties. It's a bit like studying wine tasting. Nonetheless, Lavanya has made significant progress, through a combination of computational modeling/computer vision and behavioral experiments.

Before she and I began working together, she had done some nice work in finding a biologically plausible cue for surface shininess, as well as cues to the darkness of a material. This was a nice piece of work, involving both behavioral experiments and computer-vision style modeling.

Lavanya and I started working together when we got the idea to use eye tracking to get an idea of what cues people might use to make material judgments. The data was essentially noise, with virtually no agreement between observers. Why would that be? Well, our later experiments showed that people are actually quite good at material judgments in the periphery – they don't, in many cases, actually need to move their eyes. There was little chance we would get interesting information out of an eye tracking study, but we had no idea,

since so little was known about material perception. Studying material perception requires energy and persistence, far more than many other fields of vision, in part because so little is known about how humans accomplish material judgments or even to what extent humans are even capable of those judgments. Lavanya has persistence in spades. She has generated far too extensive a body of work to adequately summarize here.

Intrigued by human ability to make certain material judgments in the periphery, Lavanya studied whether they could be made rapidly, as with rapid categorization of objects and scenes. She found that in fact, in a number of different paradigms, material category judgments are also quite rapid. However, she was concerned that these results might be interpreted merely as due to fast object recognition. (This is one of the odd difficulties/benefits of studying material perception: by and large no one thinks to ask about rapid object identification, “was that fast because judging material properties is fast?” Yet surely one way we tell that a bagel is not a donut is that it is made of bagel material.) Lavanya also wanted to test whether people might be making material judgments rapidly based on a simple cue. For instance, if all plastic were orange, it might be quite easy to identify plastic.

She has run, at this point, a large number of experiments attempting to rule out simple explanations for rapid material classification. She collected a large number of pictures of real and fake objects – the fakes were made of the “wrong” material, e.g. cupcakes made from yarn. She demonstrated that people can make rapid judgments of real vs. fake, even though by design object identity alone is insufficient to make the judgment. She has also degraded images in a number of ways that preserve simple feature cues but nonetheless strongly interfere with material judgments, thus providing evidence that the rapid perception is not due solely to simple cues. Furthermore, we have collaborated with Ce Liu to throw as many computer vision techniques as we could at the material classification problem, and shown that there was still a large gap between human and computer performance at the task.

Lavanya is a careful experimenter, good at both working out the details and at keeping the overall goal in mind. Furthermore, many of her experiments involve computational modeling, either to attempt to control the stimuli (“are there any obvious low-level cues that people might be able to use to do the task?”) or to analyze the data (“given where people look when judging whether a plant is real or fake, can we learn what features they are using?”). Lavanya is quite talented at the image processing and machine learning necessary for these tasks.

Lavanya is very bright, capable, self-motivated, organized, mature, and determined. She is very pleasant to work with, as she always seems to be in a good mood, and manages to be very smart without a hint of arrogance. I highly recommend her for your position.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ruth Rosenholtz', with a stylized, cursive script.

Ruth Rosenholtz