# Statistical Inferences on Shape Manifolds

organized by
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Workshop Summary

The quantitative study of shapes dates back to the first half of the 20th century and has gained new impetus in recent years due to a large inflow of new ideas from areas such as computer vision and medical imaging. Modern approaches to shapes involve a combination of methods from differential geometry, analysis, statistics and computer science, so the workshop brought together experts from these areas, as well as a number of graduate students and recent PhDs. The total number of participants was 33.

Four main topics were discussed at the workshop, namely:

(i) shape representation using groups of diffeomorphisms; (ii) shapes of planar curves; (iii) landmark representation of shapes and shape statistics; (iv) shapes of 3D objects using medial axis representations.

Due to the interdisciplinary nature of shape analysis and the diverse background of the participants, the program included several introductory presentations aimed at establishing a common language and facilitating communication; these presentations were followed by lectures addressing more advanced themes. The introductory talks were presented by Laurent Younes, Washington Mio, John Kent, Anuj Srivastava, and Ken Stephenson. More advanced talks were presented by Ulf Grenander, Michael Miller, Jonathan Kaplan, David Mumford, Tony Yezzi, Peter Michor, Kanti Mardia, Vic Patrangenaru, and Peter Giblin. A poster session allowed all participants to present their research; approximately 15 poster were presented. In all, the program included 14 oral presentations, a poster session, demonstrations of software, and six formal discussion sessions. Additionally, there were numerous informal small group discussions throughout the workshop. The lectures generated a wonderful interaction among participants, offered several different perspectives on various problems, and gave experts in one area an opportunity to learn about techniques and details from other areas.

In recent years, many different representations and metrics have been proposed for the study of shapes. One of the highlights of the workshop was a cohesive picture of recent developments that emerged from the lectures and discussions. Common grounds were identified that bring together seemingly disparate treatments of shapes. In particular, David Mumford led the formulation of a hierarchy of representations and metrics that have been used in recent years for the analysis of shapes.

One of the important outcomes of the discussion sessions was the identification of recent trends and open problems in shape analysis. A list of problems arising from these discussions is being compiled and is expected to influence future research in the area. The list of problems will be published on a Web site in the near future. This WWW site will also feature all talks, posters and papers that were presented or discussed at the workshop.

Many participants anticipate new collaborations as a result of interactions and discussions initiated at the workshop.