

**Fall 2015 CSCE 624:
Sketch Recognition**

Instructor:

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SRL Lab: 327 Teague

Lecture:

HECC 201
Mon, Wed, Fri
11:30 AM to 12:20 PM

TA Contacts and emails and office hours:

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Instructor Class Office Hours:

After class and by request

Course Description:

Credit 3. Sketch recognition is the automated recognition of hand-drawn diagrams by a computer. Research in sketch recognition lies at the crossroads of Artificial Intelligence and Human Computer Interaction. Recognition algorithms usually are gesture-based, appearance-based, geometry-based, or a combination thereof.



Sketch recognition is a growing topic of interest to many people as graphical diagrams pervade education, business, design and many other domains. Students draw diagrams in fields as various as business, math, computer science, engineering, music, and many others. Hand-sketched student diagrams aid in active learning and creative processes.

This course will attempt to be an introduction to sketch recognition algorithms and their uses. Students will learn about a myriad of sketch recognition algorithms that rely on drawing style, geometry, context, timing, bitmap, and other features, and the techniques used to recognize sketches from these features including rule-based, template-matching, linear and quadratic, HMM, Bayesian Network and other based classification algorithms. User interface techniques and issues will also be addressed, such as beautification and editing of diagrams. Students will walk away with an overall understanding of the pitfalls and advantages of the different techniques and features as well as detailed implementation notes as to how to implement them.

Prerequisites

Artificial Intelligence, Software Engineering, Programming experience in several algorithms, General knowledge expected of a graduate student in computer science

Topics:

I. Introduction to Sketch Recognition

- a. Origins (Sutherland)
- b. History (Newton)
- c. Importance
- d. General Overview of Techniques

II. Gesture-Based Algorithms

- a. Feature-based stroke recognition
- c. Feature Analysis
- d. Template Matching
- e. Overview of classification methods
 - i. Linear Classifiers
 - ii. Quadratic Classifiers
 - iii. Support Vector Machines
 - iv. Hidden Markov Models
 - v. Neural Networks
 - vi. Bayesian Networks
 - vii. Kernel Methods

III. Appearance-Based Algorithms

- a. Overview of Vision literature
- b. Shape Context (bullseye)
- c. Constellation Models
- d. Bitmap-based techniques

IV. Geometry-Based Algorithms

- a. Cusp Detection
 - i. Curvature
 - ii. Speed
- b. Primitive Recognition

- c. High Level Recognition
 - i. Domain Specific
 - ii. Constraint-based
 - iii. Graphical Models
- V. Combination Methods
 - a. Integrating Path-based and Geometric Features
 - b. Combining Multiple Recognizers
- VI. Shape Versus Text
 - a. Paragraphs
 - b. Letters
 - c. In context
 - d. Out of context
- VII. Context & Learning
- X. User Interfaces & Applications

Deliverables:

Class Participation: 10%

Quizzes and Tests: 40%

Homeworks: 20%

Final Project: 30%

This assessment is only a guideline, students need to perform well in each section in order to do well in the class.

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The following ADA Policy Statement (part of the Policy on Individual Disabling Conditions) was submitted to the University Curriculum Committee by the Department of Student Life. The policy statement was forwarded to the Faculty Senate for information.

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As commonly defined, plagiarism consists of passing off as one's own the ideas, work, writings, etc., that belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of

another person and turn it in as your own, even if you have the permission of the person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules [<http://student-rules.tamu.edu>], under the section "Scholastic Dishonesty".

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Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the Texas A&M University community from the requirements or the processes of the Honor System. For additional information please visit: <http://www.tamu.edu/aggiehonor>

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This course has a zero-tolerance policy. Academic misconduct on any assignment will result in failing the entire course! All such cases will be referred to the Aggie Honor Council for additional disciplinary action by the University. Finally, misconduct will also result in an "Unsatisfactory" rating on the annual departmental review of Ph.D. students. Please refer to <http://www.tamu.edu/aggiehonor/acadmischconduct.htm> for more information about the scope and meaning of academic misconduct.

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