

### Low-quality Students' Projects in the Past

The capstone-project developments for the last 15 years were analyzed revealing the **lack of novelty, weakness of applications, and low quality of the project-related artifacts**.

There are a few examples of such CS students' "shallow" projects circulated on the Internet:

- "Library Online Management System",
- "Furniture Online Shop",
- "Online Bus Reservation System",
- "Mobile Billing System", etc.

### New Criteria for CS Final Capstone Projects

**New project criteria** were recently introduced:

- orientation on practical application,
- novelty,
- application of the structured methodology in project development,
- quality of the project-related artifacts, creating a system demo,
- building a project portfolio that can be used for internship/job interview and career promotion.

### Renaming the Capstone Project course as the CS Professional Seminar

For selecting a "good" project topic, students are encouraged to lead **discussions on various "future-oriented" technologies**, e.g. [1, 2]:

- "Life after the Internet",
- "How Biology Became an Information System",
- "Environments Become Smart", etc.

Also, every student led **discussions on the outstanding selected peer-reviewed articles** from professional journals, e.g.:

- "Websites Convert Photos into 3D Models",
- "Automatic Information Extraction from Large Websites",
- "Online Analytical Processing",
- "Quantum Computing",
- "The Future of Electronic Displays", etc.

This search for knowledge helps students stay at the cutting edge of computer science. In addition to these activities, students read the ***Craft of Research* textbook** [3] that helps them develop research skills.

### Novelty in Recent Students' Final Projects

The **novelty** is featured in the wide variety of students' **recent projects**:

- "Modeling a Digital Video Cluster",
- "Design and Implementation of an IoT Smart Farming System",
- "Applying Xamarin™ Cross Platform Framework for Smart Glasses Design",
- "Personal Encrypted Talk Tool",
- "Cloud-based Searchable Storage Cryptosystem",
- "A Public Resource Computing Platform for Simulating N-Body Galaxies",
- "A Musician's Web-service Using Ruby-on-Rails, SOAP, FLEX, and AJAX",
- "Secure Online Biometric Authentication",
- "Data Visualization through Chernoff Faces",
- "Tactus: A Learning Game for Children with Autism", etc.

### Typical Stages in Project Development

Students should follow the established project-development procedures and standards:

- project planning and feasibility study,
- functional analysis,
- system architectural design,
- code programming,
- system prototyping and testing.

### Examples of Outstanding Projects:

Saroj Maharjan 'G19 applied the **Struts™ methodology framework** for developing a web application that allows a user to adapt to the social networking environment.

Kevin Gill 'G11 developed the **Living Mars project** that included methods of computer graphics and planetary science. With the jDem846 tool, he created a visualization of the Mars as could look with a living biosphere.

Vijaya Dommeti 'G17 presented the paper "**Applying and Exploring Bayesian Hypothesis Testing for Large Scale Experimentation in Online Tutoring Systems**" at the ACM Conference (MIT, 2017).

Students are encouraged to pursue **"extra-mile" scholarly activities** (e.g., publish an article in a peer-reviewed journal, or present a paper at a conference) and share their research results with the global community of scholars. Several talented students included their **portfolios** into applications for the further studies in **Ph.D./Computer Science** programs at M.I.T., W.P.I., UMASS-Lowell, UNH. ■

REFERENCES: [1] P. J. Denning and R. M. Metcalfe, eds. *Beyond Calculation*. New York, NY: Fall-Verlag, 1997.

[2] P. J. Denning, editor. *The Invisible Future*. New York, NY: McGraw-Hill, 2002.

[3] W. C. Booth, et al. *The Craft of Research*, 4th edit., University of Chicago Press, 2013.

