

CCITT Newsletter

**Center for the Commercialization of
Innovative Transportation Technology**

Moving Research to Realization for Surface Transportation

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UNIVERSITY**

A Note From The Director

In this new issue of the CCITT newsletter we introduce our CCITT education program. Our primary objective is to provide an opportunity for any Northwestern undergraduate student to investigate the world of transportation. Through an internship program, students gain experience in market research and industry analysis by examining the market landscape of the commercialization projects that CCITT funds.

Our goals include:

- provide students with enriching, real-world analytical opportunities; and
- provide faculty researchers with market information to assist with invention disclosures and patent filings at the University and with better understanding of commercialization strategies.

In the future, we also hope to provide opportunities for students to develop marketing plans for faculty members as part of independent studies for class credit in partnership with the Farley Center for Entrepreneurship and Innovation at the McCormick School of Engineering and Applied Science.

We look forward to working with existing and new students in 2009.

Yours truly,

Bret Johnson



CCITT Launches Education Program

CCITT has recently implemented a new internship program for Northwestern University undergraduates. The program, which will seek applicants from a broad range of academic majors and minors, is designed to involve students in the transportation industry who might not otherwise consider it.

“We want to provide an opportunity for students to pursue an internship in marketing and industry research in the area of transportation because it’s a field that most have never thought about,” said CCITT director Bret Johnson. “It might not seem exciting like information technology or management consulting, but it’s one of the core foundations of our country. It’s a big driver of why, as a country, we’re economically successful.”

It is no secret that the new Presidential administration seeks to invest in rebuilding transportation infrastructure. There may never be a better time for students to put transportation on their résumés, and look to an old industry for new career opportunities.

CCITT will look to four Northwestern undergraduate programs for its interns: the Business Institutions Program in the Weinberg College of Arts and Sciences; the Kellogg School of Management’s Certificate Program for Undergraduates; the

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“I’m learning what you need to do for market research, and how marketers get to the conclusions they get to.”

Engineering and Applied Science; and the Undergraduate Minor in Transportation and Logistics, also in the McCormick School.

The program has two goals: to give students an opportunity to get involved in the transportation industry while gaining practical work experience; and to uncover market information that will be useful to faculty members and Northwestern’s Technology Transfer Program. So far, the program is accomplishing both objectives.

Phillip Reich, a senior majoring in economics and international studies while earning a minor from the Business Institutions Program, was CCITT's first intern last summer.

His internship gave him "great real-world experience," Reich said. "I came into [the internship] not having done market research, and it was a great opportunity to use the skills I learned in my Business Institutions Program classes and connect them to real experiences," he said.

During his summer-long internship, Reich first had to learn about the new technology he was researching – a type of steel that is particularly weather-resistant and durable – and then determine the possible markets for the product.

As part of his research, Reich talked to Northwestern professors with expertise in steel production and a local steel company to get a sense of how steel production is done. He also contacted representatives of state departments of transportation, particularly in northern states, to garner interest in the product. Reich's research culminated in a presentation he gave to the principal investigators, where he presented them with his findings and a marketing strategy for their product.

Reich believes the real-world experience that he gained from the CCITT internship will help him get a job and jump right into working. "I have experience in market research and how

to go about it now," he said. He said he also has more knowledge about and interest in the transportation industry.

"I didn't realize how much goes into the transportation process," he said.



Phillip Reich, CCITT Intern

Kelila Venson, also a senior in the Business Institutions Program, is CCITT's current intern. She began her internship in September and will stay on through the spring 2009 quarter.

Venson is doing market research for professors who have developed an algorithm to predict travel times based on historical data for the Gary-Chicago-Milwaukee corridor. Venson's task: to find out who would want this data, how they would collect it, and why. It involves a lot of reading and calling people, she said, and learning

technical terms like "GPS." "I have a lot of Google moments," she said.

Venson said she's learning what market research really is.

"You take classes but you don't get real experience from them," she said. Through this internship, she said, "I'm learning what you need to do for market research, and how marketers get to the conclusions they get to."

Before she began her internship, Venson had no particular interest in transportation. But she saw that the internship was open to Business Institutions Program students and liked that it had a connection with Northwestern. Most important, she thought it would be a good experience.

Research Updates

Super-Tough Steel for Bridges and Other Infrastructure Applications

PI: Semyon Vaynman, Co-PIs: Morris E. Fine, Yip-Wah Chung



Kelila Venson, CCITT Intern

As it turns out, the transportation aspect has been much more interesting than she expected. “I didn’t apply because of the transportation aspect but I’m happy that it has that,” she said. “I didn’t know what to expect because I didn’t have a transportation background, but it has definitely been a learning experience,” she said. “The language is very technical, and you have to know what you’re researching, so you have to dig a little more and deeper,” she said.

Venson said she’s happy that Johnson offered the CCITT internship to students in any field, and not just engineering students. “This internship has taught me not to close my mind off to something because it’s not directly related to the field I think I want to be in, because I can learn something valuable from it,” she said.

The CCITT internship has exceeded Venson’s expectations. “I’m doing lots of independent work,” she said. “I have to find the information, put it together, and present it. It’s more responsibility than I thought I’d have. Some internships are just getting coffee. I’m definitely not getting coffee here.”

In the search for a new steel, deemed more desirable for infrastructure applications like bridges and tank cars, a research team has sought to develop an appropriate steel with high fracture toughness at low temperatures. Semyon Vaynman and Professor Emeritus Morris Fine, along with Professor Yip-Wah Chung, are building on their experience developing the A710 Grade B high-strength steel at Northwestern University to design a next-generation steel with even higher fracture toughness.

Recently, a 50-pound sample of steel was produced at Sophisticated Alloys, and its mechanical properties were tested at Northwestern University. The yield strength of the steel exceeded the target of 60-ksi and Charpy specimens did not fracture down to -60°F. The properties of the steel were summarized in a report that was disseminated to steel producers and steel consumers, including a number of northern state DOTs. Thus far, the researchers have received a positive response from the Montana DOT.

Union Tank Car Company (UTLX) also expressed interest in the 50-pound sample test results. Further progress includes the production of a larger, 300-pound heat, also manufactured by Sophisticated Alloys, for additional testing. Northwestern and UTLX will test the mechanical properties of the steel and UTLX will include the steel in a puncture-test program. If the testing meets expectations, UTLX may order enough steel for one or two tank cars.

The researchers are also studying the effect of titanium concentration on the low-temperature fracture toughness of the steel. The team seeks to understand the optimum mixture of titanium in the alloy. US Steel Company produced, at no cost to the investigators, three 100 pound steel heats with varying amounts of titanium. Depending on the outcome of tests at Northwestern and US Steel, the researchers will provide steel samples to the Montana DOT, UTLX and other entities for further testing and evaluation.

Potential uses for the super-tough steel include structural

applications, such as bridges, for northern state DOTs and also production of tank cars that transport cooled liquids such as chlorine. The research team's ultimate goal is to determine the optimal alloy composition, prepare documentation for an appropriate steel standard and find collaborators who will promote the use of the super-tough steel in practice.

Video Traffic Analysis for Abnormal Event Detection

PI: Aggelos K. Katsaggelos, Co-PIs: Sotirios A Tsaftaris, Ying Wu

The team of Aggelos Katsaggelos, Sotirios Tsaftaris and Ying Wu are working to develop a video analytics system that will evaluate video data for anomalous traffic events. The investigators initially aim to develop software that plots both normal and unusual traffic trajectories using archived video databases. The underlying software analytics will subsequently differentiate normal clusters of traffic trajectories from anomalous paths.

As the first step, the researchers collected video data from various sources, implemented a vehicle-tracking algorithm, and characterized traffic patterns into abnormal and normal categories. According to the team, the Next Generation Simulation (NGSIM) aerial traffic video dataset of the Federal Highway Administration (see: <http://ngsim.camsys.com/>) provides the most viable option for acquiring clean, usable traffic data. This source gives the researchers highway traffic videos from multiple cameras with limited data compression and good video resolution.

The team has run several simulations of its tracking algorithm using the NGSIM data. The algorithm successfully detects objects entering the video, generates a statistical background model of the scene from a few early frames of the video, and identifies moving objects -- such as vehicles or people -- from the surrounding areas. The team has been able to demonstrate the ability to map clusters of normal traffic trajectories and then detect and map unusual trajectories. In the future, the team plans to investigate three factors that are relevant to using video analysis for event detection: the impact of time-of-day on traffic patterns, vehicle intersection or occlusion and the macroscopic context of the traffic situation.

Providing Reliable Route Guidance

PI: Yu "Marco" Nie, Co-PI: Peter Nelson

The goal of Marco Nie and Peter Nelson's commercialization project is to develop the "Chicago Testbed for Reliable Routing," or CTR. The team has developed a prototype Windows-based software application that is available upon request for download. The early version of the software tool visually depicts and analyzes Gary-Chicago-Milwaukee (GCM) corridor data, generates travel time distributions and provides reliability-based routing guidance.

Nie and Neslon, with graduate student Xing Wu, first tested and evaluated several approximation algorithms for the reliable-route problem. After selecting a suitable combination of algorithms, the team mapped geographic information system data from the GCM information database to the Chicago Metropolitan Agency for Planning's Chicago regional road network model. This effort provided a more comprehensive road network to test the reliable-route software application.

The investigators ultimately expect to make CTR available on the Internet through the Artificial Intelligence Laboratory at the University of Illinois at Chicago.

Tech-Transfer News

Professor Marco Nie and PhD candidate Xing Wu will present the paper, "Some Implementation Issues in Approximate Algorithms for Reliable A Priori Shortest Path Problem," at the 88th Annual Meeting of Transportation Research Board in Washington, DC in January 2009.

Nie and Wu also will present the paper, "Reliable A Priori Shortest Path Problem with Limited Spatial and Temporal Dependencies" at the 18th International Symposium on Transportation and Traffic Theory in Hong Kong in July 2009.

For questions or comments regarding the CCITT newsletter, please contact us at

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