# STC Research Project Description

<table>
<thead>
<tr>
<th>Project Title:</th>
<th>Using Hierarchical Tree-Based Regression Model to Predict Train-Vehicle Crashes at Passive Highway-Rail Grade Crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Investigator:</td>
<td>Xuedong Yan, Ph.D. and Stephen H. Richards, Ph.D., P.E.</td>
</tr>
<tr>
<td>University:</td>
<td>The University of Tennessee</td>
</tr>
<tr>
<td>Telephone:</td>
<td>(865) 974-0298</td>
</tr>
<tr>
<td>Email Address:</td>
<td><a href="mailto:xyan1@utk.edu">xyan1@utk.edu</a></td>
</tr>
<tr>
<td>Project Start Date:</td>
<td>December 1st, 2008</td>
</tr>
<tr>
<td>End Date:</td>
<td>December 30th, 2009</td>
</tr>
<tr>
<td>Other Milestones, Dates:</td>
<td>March 1st, 2008 – A paper was submitted to the journal of Accident Analysis &amp; Prevention</td>
</tr>
</tbody>
</table>

## Project Objective:
The objectives of this project are to apply HTBR models to predict train-vehicle crash frequencies for passive grade crossings controlled by crossbucks only or stop signs respectively and assess how the crash frequencies change after stop-sign treatment is applied at the crossbuck-only-controlled crossings.

## Project Abstract:
This study applies a nonparametric statistical method, Hierarchical Tree-Based Regression (HTBR), to explore train-vehicle crash prediction and analysis at passive highway-rail grade crossings. Using the Federal Railroad Administration database, the research focuses on 27 years of train-vehicle accident history in the United States from 1980 through 2006. A cross-sectional statistical analysis based on HTBR is conducted for public highway-rail grade crossings that were upgraded from crossbuck-only to stop signs without involvement of other traffic-control devices or automatic countermeasures. In this study, HTBR models are developed to predict train-vehicle crash frequencies for passive grade crossings controlled by crossbucks only and crossbucks combined with stop signs respectively, and assess how the crash frequencies change after the stop-sign treatment is applied at the crossbuck-only-controlled crossings.

## Task Description:
This project includes five major research tasks as described in the body of the proposal.
- Task 1: Literature Review
- Task 2: Data Preparation
- Task 3: Statistical Modeling of Train-Vehicle Crashes
- Task 4: Final Research Report

## Total Budget: $25,000

## Student Involvement (Thesis, Assistantships, Paid Employment):
One Ph.D. students involved this project to assist in data preparation.

## Relationship to Other Projects:
No direct relationships

## Technology Transfer Activities:
A paper was published in the journal of Accident Analysis & Prevention

## Potential Benefits of Project:
The study results indicate that stop-sign treatment is an effective engineering countermeasure to improve safety at the passive grade crossings. Decision makers and traffic engineers can use the HTBR models to examine train-vehicle crash frequency at passive crossings and assess the potential effectiveness of stop-sign treatment based on specific attributes of the given crossings.

## TRB Keywords:
Grade Crossing; Hierarchical Tree-Based Regression; Annual Crash Frequency; Vehicle-Train Crashes; Crossbucks; Stop Signs.