

facile microwave process is demonstrated. The microwave approach is more effective for large-scale production of high quality nanoparticles. The procedure consisted of making a precursor solution to be used in the microwave reactions. The precursor was obtained by using  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$  and  $\text{HCl}$  with a series of capping agents lecithin, green tea extract, pure tannic acid, and poly(bisphenol A carbonate). The capping agent combines with lecithin to form micelles around the iron core to form the nanoparticles. A progression of microwave trials were ran in order to observe any effects on the formation of nanoparticles. The resulting products were characterized using UV-Vis spectroscopy. Iron nanoparticles usually absorb light in the 400-600nm region. Results indicated that nanoparticles are present in the reaction mixture of the tannic acid.

**UNIQUE CHARACTERISTICS OF POLYOXOMETALATES AND THEIR SYNTHESIS.** M. Smith, S. Puckett, O. Wampler, J. D. Powell, School of Natural Sciences & Mathematics, Ferrum College, Ferrum VA 24088. Polyoxometalates are clusters of highly oxidized early transition metals covalently bonded to oxygen atoms and sometimes other heteroatoms. These molecules usually contain a caged structure that encloses a smaller molecular ionic unit. They most commonly contain molybdenum and tungsten, which when combined with other metals give a wide variety of physical and chemical properties. Their complex caged structures can be rearranged by adjusting concentration, pH, and counter ions. Because of their high molar mass, polyoxometalate compounds are best characterized in the crystalline state by FT-IR and single-crystal x-ray diffraction. UV-visible spectrophotometry and electrochemistry provide supplementary characterization in solution. Lacunary polyoxometalate structures can be formed by the removal of at least one metal vertex from the cage. The remaining ions retain a high negative charge which makes them highly reactive towards metal ions and other Lewis bases. Sample reactions were observed through a series of tests on solutions containing different polyoxometalate ions. Synthesis and characterization of new polyoxometalates may produce compounds with unique chemical and physical properties for future applications.

### Computer Science

**A STUDY ON THE CHALLENGES OF BUILDING A TRUSTWORTHY NETWORK.** Yen-Hung Hu, Department of Computer Science, Norfolk State University, Norfolk VA 23504. Building a trustworthy network faces several severe challenges adhering to the current computing infrastructure (e.g., computer architectures, network architectures, operating systems, communication protocols and applications, and so on.). Since hardware and software of a network system are from various vendors and manufacturers, it is very difficult to assess trustworthiness of any system without proper criteria and methods. Meanwhile, misconfigurations of hardware and software by end-users will worsen this issue even though such hardware and software are well prepared by following appropriate industrial security guidelines. Therefore, concerns regarding criteria and methods for assessing trustworthiness should

be defined and identified first. Although the concept has been discussed more than ten years and several researchers have studied the implementation of trustworthy systems, we have observed that there is no mature approach for building a trustworthy network. There is no absolute trust between any two network components and external security mechanisms must be embedded to force this trust. In order to have a trustworthy network, we believe, security, privacy and reliability of every major network component must be enforced. For instance, if there is no trusted mechanism for protecting data transactions across different network components, a network cannot be relied on performing trustworthy computing. In this paper, we investigate the criteria and methods for building a trustworthy network and develop a trustworthy network model that is both scalable and interoperable with existing and future network architectures.

A VISUALIZATION TOOL FOR MONITORING, PREDICTING AND MITIGATING NETWORK INTRUSIONS. Yen-Hung Hu, Department of Computer Science, Norfolk State University, Norfolk VA 23504. There currently exist thousands of network attacks worldwide. Along with the explosive growth of the Internet and wireless services, the impact of network attacks has been increasing dramatically. Attacks may be denial of service, viruses or worms, port scanning, and so on. Many network intrusion detection systems have been proposed or introduced in recent years. They can be partitioned into two complementary types: misuse detection and anomaly detection. In both detection approaches, traffic classification has been the main issue affecting their performance. Traffic classification algorithms distinguish types of traffic used for various intrusion detection systems to identify flows. Since there is no single traffic classification algorithm that can be effectively applied to all traffic types, we will need to use a set of traffic classification algorithms to identify all different and complex types of traffic present in today's Internet traffic. However, high resource overhead and false positive rates will be the major challenges for potential systems and users. In this paper, we introduce our investigations and results for guiding the design and development of an Integrated Visualization Platform for Monitoring, Predicting, and Mitigating Network Intrusions which can be used to: 1) Assess network activities, 2) Depict normal and malicious network activities maps, 3) Predict future trends of network intrusions, and 4) Monitor network intrusions and mitigate their negative impacts.

#### Posters

A COMPARATIVE STUDY OF OPTIMIZATIONS TO THE BINARY SEARCH ALGORITHM. Elizabeth E Cho & Robert M Marmorstein. Dept. of Computer Science, Longwood University, Farmville VA 23909. The binary search algorithm is one of the fundamental algorithms used in computer science. It is an extremely efficient and ubiquitous algorithm for locating data in a list. Several optimizations to binary search exist which improve its efficiency on certain kinds of data. One of these

optimizations is interpolation search in which the value of the data item is used to predict its location in the list. However, the performance of these algorithms depends heavily on the distribution of the data. In this study, we compare the performance of binary search and interpolation search on data which fits several different discrete random probability distributions.

### Education

THE DEVELOPMENT OF AN INSTRUMENT TO MEASURE STUDENTS' ATTITUDES TOWARD SCIENCE FAIRS. Kurt Y. Michael & Claudia A. Huddleston, School of Education, Liberty University, Lynchburg VA. 24515. Every year, thousands of students participate in science fairs, however, little is known about their attitudes toward science fairs. The purpose of this study was to develop an instrument that measured students' attitudes toward science fairs and determined the instrument's validity and reliability. The instrument was field-tested using 110 students in southwest Virginia. The instrument originally consisted of 45 questions. After applying a principal component factor analysis, the instrument loaded on two domains, enjoyment and value. Each domain consisted of five questions. The internal consistency for the overall instrument was calculated using Cronbach's alpha and showed good internal consistency of 0.94. Correspondingly, the sub-scale enjoyment yielded a value 0.89 and the sub-scale value yielded a value 0.90, indicating good internal consistency. Further analysis was conducted using demographic information and the results revealed a significant difference on attitudes toward science fairs based on gender. A significant difference between males ( $M = 23.0, S.D. = 7.06$ ) and females ( $M = 26.2, S.D. = 7.38$ ) was found,  $t(98) = 2.04, p = 0.04$ , whereas eta squared equaled 0.12 demonstrating a large effect size. Overall, females had a more positive attitude toward science fairs than males.

APPLICATION OF SIMULATION – BASED APPROACH IN PHYSICAL CHEMISTRY INSTRUCTION. Edmund M. N. Ndip, Department of Chemistry & Biochemistry, Hampton University, Hampton, VA 23668. The majority of professionals in the STEM disciplines are well versed in the content of their respective disciplines. There is general consensus that learning is best achieved by doing. Each scientific discipline and sub-discipline poses problems for the learner. Physical chemistry – the sub-discipline of chemistry that deals with the mathematical and theoretical foundations of all the chemical sciences is no different. A fundamental difficulty is the abstract nature of its concepts. Simulation based approach is a technique used to replace real experiences with guided ones often requiring active participation by the learner. Simulation based activities have been implemented to facilitate instruction in areas requiring higher mathematical skills through a combination of object oriented programming using VenSim PLE, numerical simulations using Excel, quantum mechanical modeling/calculations and visualization