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This document contains the submitted abstracts of the 20-minute presentations at UPPAC 2008. Abstracts for presentations not given are also documented at the end. Award-winning abstracts are presented first, then the rest follow in order of presentation.

First Prize Presentation:

Rocky So (UBC): "Measurement of Upsilon(1S) at the BaBar Experiment"

BaBar is a particle physics experiment at the Stanford Linear Accelerator Center (SLAC). The purpose of BaBar is to study matter-antimatter asymmetry in the bottom quark system. At SLAC, electons and positrons collide, which annihilate and make Upsilon(4S) mesons. An Upsilon(4S) decays into a B meson and an anti-B meson (called a B-bar) more than 96% of the time. B mesons contain anti-bottom quarks and anti-B mesons contain bottom quarks. The purpose of this thesis is to measure how many Upsilon(1S) originated from Upsilon(4S) in the entire BaBar data set. This thesis compares on-peak data and off-peak data. On-peak data, taken at center of mass energy 10.58GeV, is just enough to produce Upsilon(4S) because its mass is 10.58GeV/c^2. Off-peak data, taken at center of mass energy 10.54GeV, is not enough to make any B meson pairs because it is less than the mass of an Upsilon(4S). This thesis is useful for BaBar physicist because it helps set an upper limit on how many BB-bar pairs there are in the entire BaBar data set. In other words, it sets an upper limit on how much more than 96% does Upsilon decay to BB-bar. Preliminary analysis shows an excess of 160000 ± 8000 events out of about 465 million Upsilon(4S) events at 9.46GeV/c^2, which is the mass of an Upsilon(1S). Further analysis of the angular distribution of the excess events will tell us if they decayed from an Upsilon(4S).

Runner-Up Presentations:

Christie McPhee (UBC): "Finding Pulsars with Green Bank Telescope Drift Scan Survey"

Over the summer of 2007 the 350 MHz drift-scan survey was done with the 100 m Green Bank Telescope in order to search for pulsars. Over 1491 hours of observing time approximately 134.2 TB of data was taken. Currently the data is being processed by groups at UBC, McGill, Cornell, UTB, WVU, Amsterdam and NRAO. So far ~4 TB of the data has been processed at UBC, which has led to the discovery of 1 new pulsar, the detection of 9 known pulsars, and identification of several pulsar candidates. I will discuss the goals of the survey, and the progress made so far at UBC and my contributions to the project which was done for my Honours Thesis.

Kelly McPhee (UBC): "Implementation of an MRI stability analysis protocol for functional MRI quality assurance"

Functional magnetic resonance imaging (fMRI) is a highly effective, non-invasive method for researching brain function. In an fMRI study, a series of images is collected of a subject's brain during task and control intervals. Brain activity induced increased blood flow to areas of the brain related to the task, which in turn induces a signal fluctuation in the time series of the image. These images are analyzed with a statistical model to localize the areas of activity. The fluctuations in signal activity

related to brain function are only on few percent of the raw signal intensity, and thus the stability of the scanners main magnetic field is of utmost importance during these studies. In order to monitor scanner stability both during and between scans, a quality assurance protocol was implemented at BC Children's Brain Mapping Center.

Presented Abstracts:

Simon Hastings (UBC): "Molecular Dynamics of Aging in Glasses"
An examination of molecular dynamics simulations of polyethelene and configurational factors effecting aging in glasses.

Jacob Cosman (UBC): "Possibly Anomalous Muon Spin Relaxation in Gadolinium Stannate"
Following reports of experimental results contrary to theoretical predictions, a model for muon spin relaxation in antiferromagnetic pyrochlores was developed in an attempt to reconcile these results.

Alison Faulkner (UVic): "International Year of Astronomy"
A brief introduction to the vision and purpose for the IYA with an overview of the focus and cornerstone events.

Reginald Bauld (UBC): "Angular Resolved Photoemission Spectroscopy"
Angle Resolved Photoemission Spectroscopy is a powerful tool in which we can directly measure the band structure of a crystal. Superconducting Copper Oxides exhibit strange behavior through out the Cuprate phase diagram. Nodal Fermi arcs appear in the resulting spectrum as we move into the underdoped (hole) regime. These arcs cannot be explained in terms of the standard band theory, which cannot deal with highly correlated systems. I am examining the ARPES spectra of YBCO to determine if we see similar behavior.

Michael Lindstrom (UBC): "Calculating Gluon Scattering Amplitudes"
This project attempts to compute strongly coupled gluon scattering amplitudes in gauge theory. We provide an overview of this area of research and briefly summarize the recent solution of 4 gluon scattering. We then proceed to explain our current problem of interest: a particular configuration for the scattering of 6 gluons and the methods undertaken thus far to find the solution.

Rob Hocking (UBC): "Real Time Rendering of Black Holes"
I describe a procedure for creating a computer program that will compute the appearance of the sky in the vicinity of a rotating black hole. I then describe how to speed this process up so that the program can operate in real time, allowing the observer to fly around the black hole interactively.

Jed Brewer (UBC): "Process Physics: a Heraclitean Pregeometry"
The intent of this talk will be to introduce the audience to the basic concepts of Process Physics, a Heraclitean pregeometry, as developed by Reginald Cahill. A discussion will be presented of the epistemic justifications for the model, possibilities for variation, and derivation of self-referential neural networks leading to self-evolving geometric structures. Special attention will be paid to emergent dimensionalities and their agreement with the large and small scale structure of spacetime.

Andrew Wilson (UBC): "Position Emission Tomography for Liquid Xenon Positrons"
Position Emission Tomography is a nuclear medical imaging technique that can produce a three-dimensional map of functional processes in the body. These images can be used, for instance, to

localize and understand brain functions, and to diagnose people with neurological, psychiatric, or other critical medical conditions.

A promising new liquid xenon PET device is in development at TRIUMF. I will talk on how we can reconstruct the position and energy of a particle emitting "scintillation light", towards producing images with this new and unconventional device. My talk will include a discussion of machine learning paradigms and neural networks, and how I have applied them to this problem.

Alan Robinson (UBC): "Liquid Argon Calorimetry for ATLAS"
This summer, the largest collaborative physics project since the Manhattan project will go online. One of four experiments for the Large Hadron Collider at CERN in Geneva, ATLAS, employs over 2000 people. Canadians have designed, constructed, and calibrated the liquid argon calorimeters for ATLAS to capture the products of the high energy collisions produced by the LHC. From nearly a billion proton-proton collisions a second, physicists hope to discover the Higgs boson and other new fundamental particles.

Abstracts not presented:

Taylor Scurr and Didier Jouen (Kwantlen University College): "Optimization methods for engineering research in the transfer program courses at Kwantlen"
Our research is related to the experimental work for the course APSC 1299- Introduction to microcomputers and consists in the delivery of comprehensive reports on all aspects involved by the weekly laboratory experiments. We have implemented an optimization working scheme which allows us to minimize efforts put in the preparation for the lab procedures and focus on the essence of the application of theoretical concepts into the synthesis of the experimental procedures. Most of the course objectives are related to the programming of various functions and a given sequence of their execution into the microprocessor PIC18F4525 and we will present the approach that we have found to be suitable to our background knowledge brought into the course requirements and to our working/study style, more like a "playing piano at four hands" and "reading with two pairs of eyes". The synergy of our team allowed us to make a fast progress into completing experimental tasks which normally take more than the double of the regular laboratory session as well as exploring and reporting findings of our own. Our personal laptops are mirrored and programming input comes from both of us, while result prediction and experimental manipulation is performed by each of us by assertive assignment of who's doing what and when and who's recording the results for interpretation. This optimization method is similar to that of electrical and computer engineers working on large control systems and increases efficiency and reliability in multitasking.
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Compiled by Henry Ngo
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