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RESEARCH INTERESTS

My research interests were shaped during the work on my M.S. and Ph.D. theses. Looking back I realise that I was lucky enough to have very interesting topics and great advisers. In both cases I studied the properties of elementary particles within the scope of the Standard Model. As of now, the theoretical predictions are in a good agreement with available experimental results. In general, my research interests belong to those areas where the SM can fail or needs to be verified.

Throughout my doctorate study I was involved in the measurement of the top quark properties. In particular, my analysis was focused on the top to bottom quark decay branching ratio $R = B(t \to bW)/B(t \to qW)$, where q is any light quark. In my analysis I used events containing $t\bar{t}$ pairs produced at Tevatron and detected by the CDF. It was found to be in a good agreement with a unity predicted by the Standard Model. This measurement was used to set an indirect confidence level limit on $|V_{tb}|$, a CKM matrix element. Although, I think that direct measurement of $|V_{tb}|$ from a single top production is an interesting and challenging task.

During my earlier research work at Moscow State University I studied the production of a low mass Higgs boson at the Monte Carlo level. In $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ GeV and with mass $M_H = 115$ GeV the Higgs boson is primarily produced in $gg \to H$, $q\bar{q}' \to WH$, and $q\bar{q} \to ZH$ parton-level interactions and then decays to a $b\bar{b}$ pair. This study was based on a selection of signal events using ANN and introduced several alternative sets of input variables. I think it would be interesting to apply it with some improvements to a real data analysis.

In High Energy Physics it is very important to have a detector with as good precision as possible because accuracy of any measurement depends on it. I am looking forward to acquire more experience within hardware projects.

Any modern analysis in High Energy Physics is impossible without solid programming skills. During my research I became an admirer of the object oriented programming. I am attracted by the possibility of the analytical description of virtually any real world object as well as its behaviour to any desired extent. This handy approach was extensively used by me to analyse the $t\bar{t}$ events produced in $p\bar{p}$ collisions at the CDF. Also, I became extremely interested in advanced data analysis techniques and their application to the HEP. Specifically, in my work I learned many practical tricks in the implementation of the Artificial Neural Networks which I believe will be useful in my future analyses. In addition, I will be glad to spend some time studying and understanding the advantages of several other sophisticated techniques such as unsupervised learning algorithms, various ANN architectures, decision trees, regression clustering, principal components analysis, and genetic algorithms. It is my strong opinion that the application of the mathematical formulae describing the natural processes of the living things will be beneficial in understanding the material world.

I am absolutely positive that my experience in HEP data analysis and extensive knowledge of the scientific software development will help me to attack the future experimental problems. And I am passionate about doing so!