

## **Construction decision support system by using Bayesian network's theory for modeling behavior of complex systems.**

**State registration:** 0109U000300

**Head** prof Bidyuk P.I.

### **Results**

Developed some of methods for solving ill-structured problems for modeling, prediction and classification. All methods use Bayesian networks. Proposed a new five step method for finding the parameters of Bayesian networks with hidden nodes. Method bases on an expectation maximization algorithm. Suggested Pearson's, Chuprov's, Cramer's, Goodman's and mutual information coefficients for finding interconnections between Bayesian network's nodes. For solving the problem of modeling the behavior of complex systems proposed original method for construction and application hybrid Bayesian networks. Methodology uses structural EM or gradient methods for constructing the topology of network. For probabilistic inference uses exact and approximate algorithms. For build probabilistic inference in hybrid Bayesian networks proposed a new approach for discretization of continuous variables by using the methods of cluster analysis.

Developed the original architecture of decision support systems for pattern recognition by using of proposed methods and algorithms. Realized computer program for data mining by using Bayesian networks. Developed program gives another users the possibility of rapid modification of computational procedures through an open modular architecture of decision support system for modeling and forecasting. Constructed some of practically important models in the form of hybrid networks and networks with hidden nodes by using developed software.

Construction of mathematical simulation model is based on statistical (experimental) data and expert estimates, which is maintained and updated in the process of using the model. For validation the correctness of the proposed theory used analytical procedures and computational experiments with big number of statistical data and expert estimates.