

### Motivations

With the rapid development of network applications, the role of methods for information processing becomes more and more important. Based on this consideration, we aim at making use of some artificial intelligent models, such as the artificial immune systems and neural networks, to design a novel collaborative model for intelligent information processing, which can be applied for the computer network improvements, especially on security, privacy, availability, etc., as well as for the navigation and collaboration of autonomous robots.

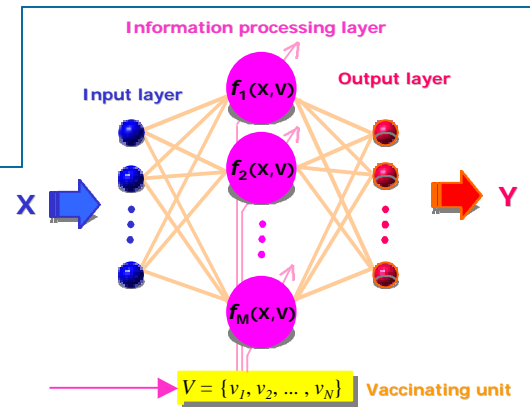
### What Are the Artificial Immune Systems?

Artificial immune systems (AIS) are adaptive systems, principles and models inspired from the theoretical immunology and the observed immune functions. They can solve or help to solve difficult problems.

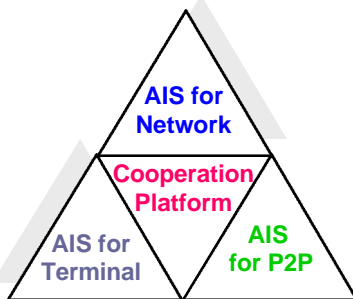
### Algorithm Based on AIS

#### — An Artificial Neural Network with Immunity

- Integrate the immune mechanism and the function of neural information processing.
- An adaptive algorithm as its network training.
- Available to simplify the original network structure with the characteristic information.



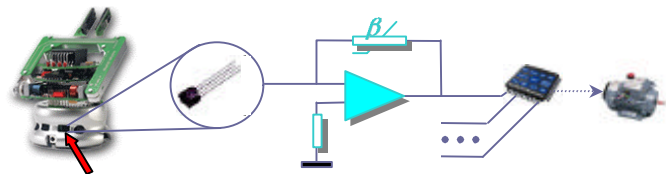
### Computer Security Model Based on AIS



- A dynamic, multi-layered and co-operational computer security system
- Dynamically supervising abnormal behaviors with a multi immune agent system.
- Two-level defense system, one is based on a host for detecting viruses and the other is based on a network for supervising potential attacks.
- PN technology is adopted for data transmission in order to increase the ability of protecting information against intended interference and monitoring.

### AIS-based Application on Autonomous Robot Control

- An immune evolutionary algorithm, IMEA, is used for improving a robot's capability of reinforcement learning.
- A robot is able to improve itself from its previous experiences so that it can adapt to the around environments.
- The parameter structure concerning sensors and motors is regarded as a decision-making network, and IMEA is just right used for this structure optimization.



### Future Works

- Research on multi-robot system with emphasis on the issues of awareness, self-reliance and the adaptiveness.
- Research on the problems of security and privacy in public networks, such as the AIS-based information processing method/system for increasing the security of user's data as well as improving the availability of system resources, information's transform with high parallelism and privacy, etc.