# Homework 8

Homework rules:

- Homeworks are due one week after they are handed out, unless otherwise specified. *No late homeworks accepted!*
- Feel free to talk to other members of the class in doing your homework. I'm more concerned that you learn how to solve the problem, than that you demonstrate that you solved it entirely on your own. You should, however, write up your solution yourself. Please try to keep solutions brief and clear. You may refer to the literature, but do not refer to handouts from previous years' classes (in case I repeat some problems from previous years).

**Due Wednesday, November 23, 1994**

## Problem 1.

Consider the network $P^2$ defined on page 123 of the Blum/Rivest paper [1]. This basically tests if the following condition is true for an $n$-input vector $x$, a $n \times n$ weight matrix $A$, and an $n$-element weight vector $b$:

$$x^T A x + b^T x \geq 0.$$

Determine, as well as you can, the VC-dimension of $P^2$. Give upper and/or lower bounds. (Note: I don't know the correct answer to this problem. It might be an open problem. Don't spend too much time on this problem if it is hard; just put in a reasonable amount of time and show what you could obtain.)

# References

[1] Avrim Blum and Ronald L. Rivest. Training a 3-node neural net is NP-Complete. In David S. Touretzky, editor, *Advances in Neural Information Processing Systems I*, pages 494–501. Morgan Kaufmann, 1989.