

## Lab problem 10/12/2005

### Power Method

- Suppose that  $A$  has  $n$  linearly independent eigenvectors and has a dominant eigenvalue  $\lambda_1$  with eigenvector  $v_1$ . Let  $y$  be any vector not orthogonal to  $v_1$ . Then for large  $m$ , if  $x_0$  is not orthogonal to  $v_1$ , then

$$\frac{A^{m+1}x_0 \cdot y}{A^m x_0 \cdot y} \approx \lambda_1.$$

- Algorithm:

**input**  $n, a_{ij}, x, M$

**for**  $k < M$

$v = x / \|x\|_2$

$x = Av$

$\lambda = x \cdot v$

**if**  $\|x - \lambda v\|_2 \leq \epsilon|\lambda|$ , **stop**

**end for**

**output**  $\lambda, v$