

. . . a neural network technology that helps doctors double-check Pap smears for suspicious cells, increasing the reliability of tests for cervical cancer.

IN ADDITION TO DETECTING
CERVICAL CANCER, HNC MAY
APPLY ITS NEURAL NETWORK
TECHNOLOGY TO SCREEN
FOR LUNG CANCER.



■ PAPNET[®] uses HNC's neural network technology to detect potentially missed abnormal cells on a woman's Pap smear.

PAPNET IMPROVES SCREENING EFFICACY FOR CERVICAL CANCER

Cervical cancer strikes about 65,000 U.S. women per year, accounting for 5,000 deaths annually.¹ However, during the past 30 years a screening test called the Pap smear accounted for a 63 percent decrease in the death rate from this disease.² Curable if caught early enough, cervical cancer is one of the few human malignancies strongly associated with the human papilloma virus (HPV). A Pap smear helps reveal the presence of HPV and helps a patient discover her risk factor for cervical cancer.

Laboratories perform over 50 million Pap tests in the United States every year.² Due to the large volume and fast turnover of test slides in a typical histology laboratory, positive test results are sometimes overlooked. When this occurs, a potentially curable carcinoma-in-situ can progress to an invasive cancer. In late 1995, Neuromedical Systems, Inc., received FDA approval for a neural net-based screening method that greatly increases the odds of detecting a suspicious Pap smear, helping to save women's lives. This computerized system owes part of its existence to BMDO funding through HNC Software Inc. (San Diego, CA).

HNC developed avalanche neural network computer architectures and systems for BMDO to detect ballistic missiles. HNC's network technology now forms the basis of Neuromedical Systems' PAPNET[®] Testing System. This system uses fast, powerful neural network algorithms to quickly identify the signs of malignancy in cell clusters. With the PAPNET test, cytology labs increase the total detection of abnormalities up to 30 percent. The FDA approved the system in November 1995, and more than 40 U.S. clinics and 15 countries now use it.

Neuromedical Systems, which acquired its software development tool for neural networks from HNC, holds a patent for applying neural networks to cell analysis. The company may apply the technology to develop automated systems for lung cancer screening, urinalysis, and other cell analyses.

ABOUT THE TECHNOLOGY

Showing the system a variety of images representing both benign and malignant cervical cells trains the computer to read Pap smears. The computer examines the images and learns the most salient characteristics of each type of cell or cell cluster. For example, large and misshapen nuclei can signify cancer. After the network is trained, it can be used in an automated system to quickly scan slides and flag abnormalities.

PAPNET uses two separate neural networks, one trained to recognize suspicious single cells, and the other trained to recognize abnormal cell clusters. The system selects and records color images of the 128 most suspicious cell images on a smear, and allows the cytologist to scrutinize them. In unassisted visual screening, the error rate (classifying abnormal smears as normal) can be as high as one in three. In a test of 1,247 Pap smears, the PAPNET system identified 517 of 534 abnormal smears, for a 97 percent accuracy rate. Note, however, that PAPNET is a supplemental screening method: A qualified pathologist makes the final diagnosis.

¹University of Pennsylvania Cancer Center. 1996. Clinical trials news: New treatment options for cervical cancer. World Wide Web at http://oncolink.upenn.edu/upcc/clin_trials/fall94/RUBIN.html.

²U.S. News Online. 1995. Health: Digital help to spot cervical cancer. World Wide Web at <http://www.usnews.com/usnews/nycu/cervical.htm>.