ENGR 518: Applied Machine Learning for Engineers 2025/2026 T1

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Exam

Total time: **40 mins + 5mins for upload** Total Mark: 45

Instructions-Part B

1. Read problems carefully.
2. You are allowed to use devices e.g., laptop.
3. This is an open-book and open-note exam.
4. Use Python to solve problems.
5. Upload your code with OUTPUTs in Canvas. **The deadline Nov 17, 2025 925 am PST**.

P-B1 (Mark: 10)

The table given shown below show the number of transistors *z* in 13 microprocessors, and the year of their introduction. The data is posted in canvas under exam. In order to find the least square straight-line fit of the data, we can use the model

$\log_{10} z \approx n_0 + n_1(t\text{-}1970)$ where *t* is the year and *z* is the number of transistors. Note that n_0 is the model's prediction of the log of the number of transistors in 1970, and 10^{n_1} gives the model's prediction of the fractional increase in number of transistors per year. Calculate and report the optimal n_0 and n_1 that minimize mean square error (you can use python).

Year	Transistors
1971	2,250
1972	2,500
1974	5,000
1978	29,000
1982	120,000
1985	275,000
1989	1,180,000
1993	3,100,000
1997	7,500,000
1999	24,000,000
2000	42,000,000
2002	220,000,000
2003	410,000,000

P-B2 (Mark: 5+4+6=15)

You are given with data set in a csv file (posted in Canvas under assignment->final exam data and upload). You need use this data to train and validate classifiers that classify blue versus orange points.

1) Train a linear classifier. **You need to use cost function of the form:** $g(\boldsymbol{w}) = \frac{1}{P}\,\Sigma_{p=1}^{P}\left[-1 + exp\left(b\left(\bar{\boldsymbol{x}}_p^T\boldsymbol{w} - y_p\right)^2\right)\right]$ but you need to use proper value of b.
2) Draw decision boundary on the feature space. This plot should be output of your code.
3) Calculate precision, recall, and accuracy on a validation data set for classifier in 1). You print these values as output of your code.