Machine Learning *CS 689, Spring 2015*

HW00: Survey and basic concepts

Hand in via moodle at: `https://moodle.umass.edu/course/view.php?id=20836`. Remember that only PDF submissions are accepted. We encourage using LaTeX to produce your writeups. See `hw00.tex` for an example of how to do so. You can make a `.pdf` out of the `.tex` by running "`pdflatex hw00.tex`".

1 Student Survey

Please note the following information on your assignment:

1. Which of the following courses have you taken: Differential calculus; Integral calculus; Multivariate calculus; Linear algebra; Probability and statistics; Artificial intelligence; Algorithms; Computer vision; Image processing; Natural language processing; Robotics; Optimization (linear, quadratic, convex, etc.)
2. List a few (research/CS/math/whatever) topics that interest you.
3. How would you rate your programming skills (1-10, 10 best)? How would you rate your math skills?
4. What are your goals in this class?

2 Additional Exercises

The following are true/false questions. You don't need to answer the questions. Just tell us which ones you can't answer confidently in less than one minute. (You won't be graded on this.) If you can't answer at least 8, you should probably spend some extra time outside of class beefing up on elementary math.

1. $\log x + \log y = \log(xy)$
2. $\log[ab^c] = \log a + (\log b)(\log c)$
3. $\frac{\partial}{\partial x}\sigma(x) = \sigma(x) \times (1 - \sigma(x))$ where $\sigma(x) = 1/(1 + e^{-x})$
4. The distance between the point (x_1, y_1) and line $ax + by + c$ is $(ax_1 + by_1 + c)/\sqrt{a^2 + b^2}$
5. $\frac{\partial}{\partial x} \log x = -\frac{1}{x}$
6. $p(a \mid b) = p(a, b)/p(b)$
7. $p(x \mid y, z) = p(x \mid y)p(x \mid z)$
8. $C(n, k) = C(n - 1, k - 1) + C(n - 1, k)$, where $C(n, k)$ is the number of ways of choosing k objects from n
9. $||\alpha \boldsymbol{u} + \boldsymbol{v}||^2 = \alpha^2 ||\boldsymbol{u}||^2 + ||\boldsymbol{v}||^2$, where $||\cdot||$ denotes Euclidean norm, α is a scalar and $\boldsymbol{u}$ and $\boldsymbol{v}$ are vectors
10. $\left|\boldsymbol{u}^\top \boldsymbol{v}\right| \geq ||\boldsymbol{u}|| \times ||\boldsymbol{v}||$, where $|\cdot|$ denotes absolute value and $\boldsymbol{u}^\top \boldsymbol{v}$ is the dot product of $\boldsymbol{u}$ and $\boldsymbol{v}$
11. $\int_{-\infty}^{\infty} \mathrm{d}x \exp[-(\pi/2)x^2] = \sqrt{2}$