

THIS IS YOUR MACHINE LEARNING SYSTEM?

YUP! YOU POUR THE DATA INTO THIS BIG
PILE OF LINEAR ALGEBRA, THEN COLLECT
THE ANSWERS ON THE OTHER SIDE.

WHAT IF THE ANSWERS ARE WRONG?

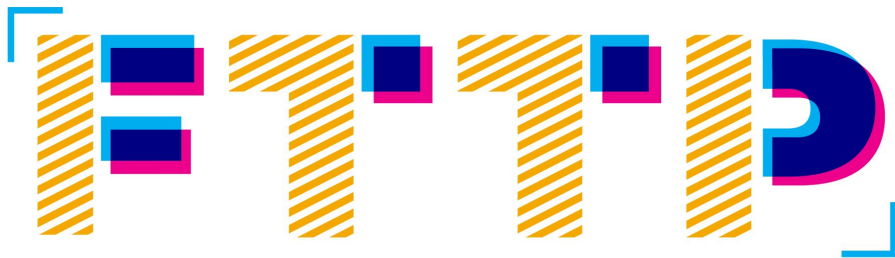
JUST STIR THE PILE UNTIL
THEY START LOOKING RIGHT.



DiskMath TA recommendation

Try Tomas Prazak in CHN D 44 on Monday 16:15

<https://www.janestreet.com/join-jane-street/programs-and-events/ftp/>



First-Year Trading and Technology Program



Feedback Serien

- Bitte immer als PDF abgeben!
- Schaut euch an wie man korrekt 1.a) formuliert.
- Sehr gute Arbeit bei 1.b)

In-Class

a) Let $\mathbf{0} \in \mathbb{R}^m$ denote the vector whose entries are all zero. We say that a set L is a line through the origin in $\mathbb{R}^m$ if and only if there exists $\mathbf{w} \in \mathbb{R}^m$ with $\mathbf{w} \neq \mathbf{0}$ such that $L = \{\lambda \mathbf{w} : \lambda \in \mathbb{R}\}$. Let now L be a line through the origin in $\mathbb{R}^m$ and let $\mathbf{u}$ be an arbitrary non-zero element of L . Prove that $L = \{\lambda \mathbf{u} : \lambda \in \mathbb{R}\}$.

b) For two lines through the origin L_1 and L_2 in $\mathbb{R}^m$, prove that we have either $L_1 \cap L_2 = \{\mathbf{0}\}$ or $L_1 \cap L_2 = L_1 = L_2$.

- c) Consider an arbitrary line through the origin L in $\mathbb{R}^2$. Prove that L is a hyperplane, i.e. find a vector $\mathbf{d} \neq \mathbf{0}$ such that

$$L = \{\mathbf{v} \in \mathbb{R}^2 : \mathbf{v} \cdot \mathbf{d} = 0\}.$$

Extra (Exam)

6. Assume that the vectors $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3, \mathbf{v}_4 \in \mathbb{R}^4$ are linearly independent. Which of the following sequences of vectors is linearly dependent? *Note: only one answer is correct.*

(a) $\mathbf{v}_1, \mathbf{v}_3$

(b) $\mathbf{v}_1 + \mathbf{v}_2, \mathbf{v}_2 + \mathbf{v}_3, \mathbf{v}_3 + \mathbf{v}_1$

(c) $\mathbf{v}_1 + \mathbf{v}_2, \mathbf{v}_2 + \mathbf{v}_3, \mathbf{v}_3 + \mathbf{v}_4, \mathbf{v}_4 + \mathbf{v}_1$

(d) $\mathbf{v}_1, 2\mathbf{v}_1 + \mathbf{v}_4, \mathbf{v}_3 + \mathbf{v}_4$

HS24

MC4. [2 Points] Consider a set $S = \{\mathbf{v}_1, \dots, \mathbf{v}_n\}$ of linearly dependent vectors in $\mathbb{R}^m$. Which of the following statements must be true?

- ☐ There exists a pair $\mathbf{v}_i, \mathbf{v}_j$ with $i \neq j$ that are linearly dependent.
- ☐ There exists a vector $\mathbf{v}_i$ so that the vectors in $S \setminus \{\mathbf{v}_i\}$ are linearly independent.
- ☐ We have $n \geq m$.
- ☐ None of the above.

HS25

Cauchy-Schwarz, Triangle ineq.

