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COOL CATS TALKING MATH

ABOUT US

- ✕ Many superlatives:
 - + Oldest
 - + Youngest
 - + Only Father-son team
 - + Furthest away
 - + Only one to arrive on two wheels

SPEECH IN – MATH OUT

- ✖ Speak math
- ✖ Shows up in web page or doc
- ✖ Math can be manipulated or evaluated
- ✖ Demo coming shortly...

SOCIAL IMPORTANCE

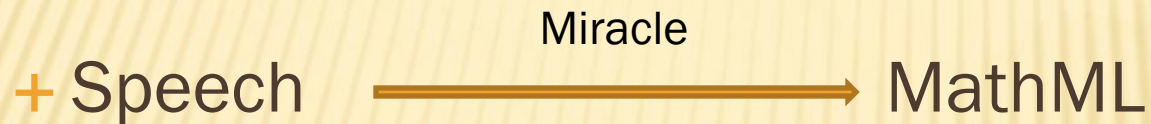
- ✖ Everyday, every child takes math in K-12
- ✖ Physical Disabilities
- ✖ Transcription for hard of hearing

TECHNICAL INTEREST

- ✖ Many different ways of saying the same thing
- ✖ $f(x^4)$
 - + f of x to the fourth power
 - + f open paren x raised to the fourth close paren
 - + f of quantity...
- ✖ Pausing is important
 - + $2x+1$ vs $2(x+1)$
 - + $2 * x$ plus 1

APPROACH

✗ One Step



✗ Two Steps



DATA, DATA, DATA

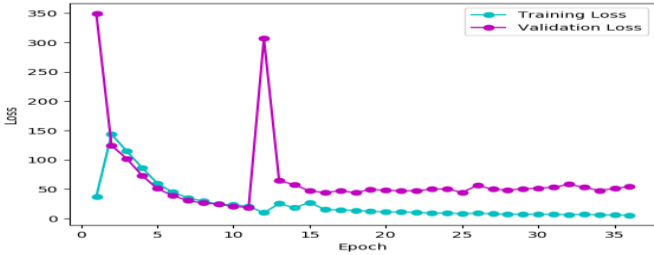
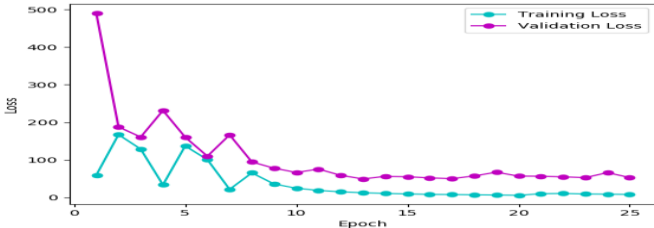
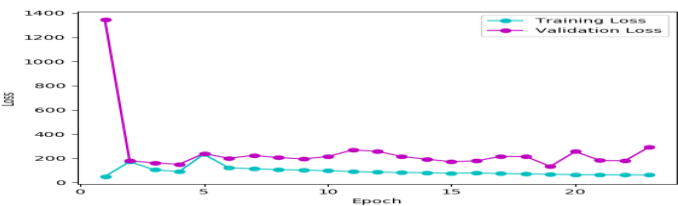
- ✖ MathML: 3 Algebra texts + questions (dups)
- ✖ → ~3x speech text strings w/cues (dups)
- ✖ → 2x voices (male/female) – 60gb

- ✖ Lots of cleanup at hackathon:
 - + Spurious single characters or empty bits
 - + Canonicalize MathML
 - + Strip toplevel (meaningless) elements

NOT ENOUGH TIME

- ✗ Used about 1/8 of data (20,000 wav files)
 - + should have used more
- ✗ 3 Runs
 - + Baidu's speech model (mostly): RNN = 3x1000
 - + Changed RNN=4x750 (learn more features?)
 - + Trained with human speech then with computer speech
- ✗ Setup vocabulary of 73 tokens
 - + $\langle \text{mfrac} \rangle$, $\langle \text{/msqrt} \rangle$, letters, digits, $\langle \text{mo} \rangle + \langle \text{/mo} \rangle$

RESULTS

	Epochs/ Loss	Loss Function
3x1000	37 / 44	
4x750	25 / 53	
3x1000 + Human	24 / ~220	

✗ Subjective: ???

THE MOMENT OF TRUTH

- ✗ No results Saturday - ran overnight and...
- ✗ Demo Time... we wish
 - + Had a website that takes speech in and shows the math, but the last minute rush didn't get something right in the Kur files

FROM THE LAST FOUR EPOCHS

Truth	Result
$25a^3b^2c, 5ac$	$25a^3b^2c, 5ac$
$3x^25xy2y^2$	$3x^2 - 5xy - 2y^2 =$
$4(x+y)^3$	$4(x+y)33\hat{a}\pm =$
$20x^3, 4$	$20x^3, 4$ (after clean tool)

- ✖ Some “potatoes” at the end in last 2 results
- ✖ Not bad for using only 20k samples (1/8 data)