# Algorithms & Models of Computation CS/ECE 374, Fall 2020

10.2

What is a good algorithm, and why use asymptotic running time?

#### What is a good algorithm?

Running time...

Input size	<b>n</b> <sup>2</sup> ops	n³ ops	n <sup>4</sup> ops	<b>n</b> ! ops
5	0 secs	0 secs	0 secs	0 secs
20	0 secs	0 secs	0 secs	16 mins
30	0 secs	0 secs	0 secs	$3 \cdot 10^9$ years
100	0 secs	0 secs	0 secs	never
8000	0 secs	0 secs	1 secs	never
16000	0 secs	0 secs	26 secs	never
32000	0 secs	0 secs	6 mins	never
64000	0 secs	0 secs	111 mins	never
200,000	0 secs	3 secs	7 days	never
2,000,000	0 secs	53 mins	202.943 years	never
10 <sup>8</sup>	4 secs	12.6839 years	10 <sup>9</sup> years	never
10 <sup>9</sup>	6 mins	12683.9 years	<b>10</b> <sup>13</sup> years	never

#### What is a good algorithm?

Running time...

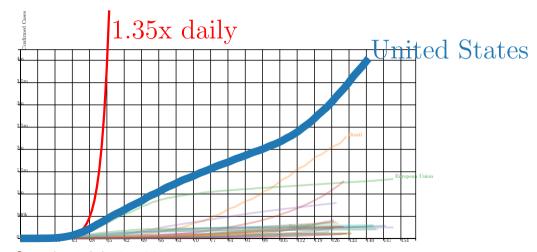
# ALL RIGHTS RESERVED http://www.cartoonbank.com



"No, Thursday's out. How about never-is never good for you?"

### Exponential growth is bad

COVID 19 cases

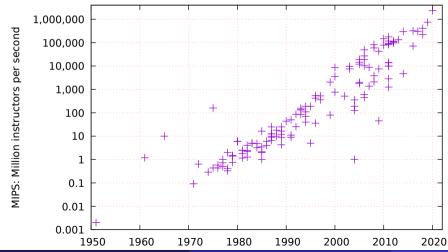


Snapshot: July 24, 2020.

#### CPU/Computer performance in MIPS over the years

No, no, no, exponential growth is good

https://en.wikipedia.org/wiki/Instructions\_per\_second



Har-Peled (UIUC) CS374 20 Fall 2020 20 / 102

# THE END

...

(for now)