Archie vs the gradient descenders

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1 Introduction

- The purpose of gradient descent is to converge to the global minimum.
- The global minimum is a point where the directional derivative is zero in all directions.
- However, the algorithm in many cases stumbles upon saddle points since even in that case the directional derivative is zero in all directions.
- This is not a global minimum since it is a minimum along one direction and a maximum along another direction.
- This frustration of the directional derivatives alone not being enough to determine extrema is seen on the man's face.

2 The Section that will win a treat

1. *The Fourier Transform:*

$$f(\omega) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \omega} dx \tag{1}$$

2. *The Normal Distribution*

$$\phi(x) = \frac{1}{\sqrt{2\pi\rho}} e^{\frac{(x-\mu)^2}{2\rho^2}} \tag{2}$$

3. *The generator function associated to collatz conjecture*

$$Y(i,k) = \begin{cases} n/2, & \text{if n} \equiv (0 \bmod 2) \\ 3n+1, & \text{if n} \equiv (1 \bmod 2) \end{cases} \tag{3}$$