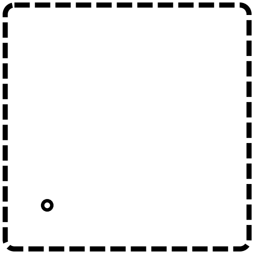
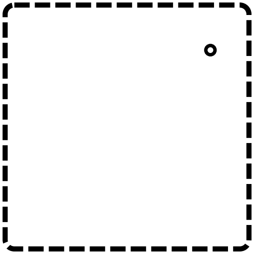
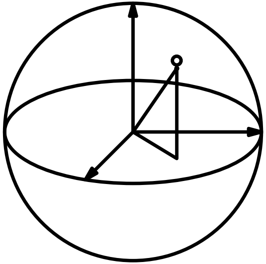
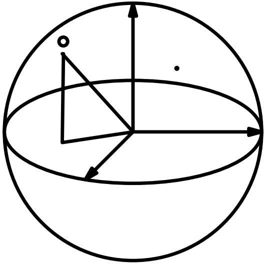
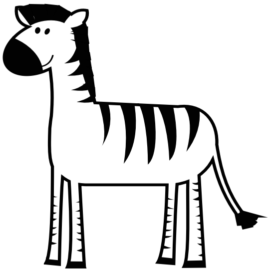
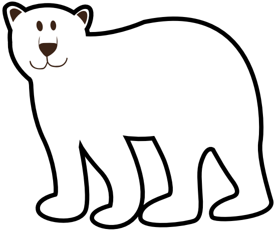
Taming Time Through Tangents

Gabriel Goh, Michael Friedlander, UBC

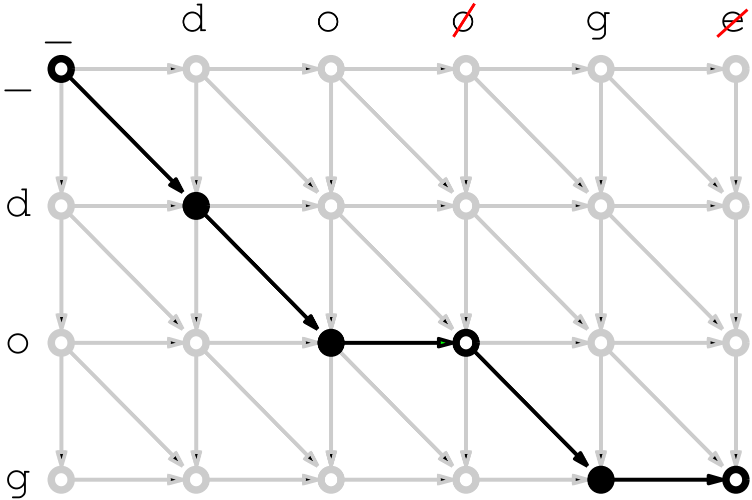
Part I:
Methods of Meausring Misfit

$d($  $,$  $)$

$d($  $,$  $)$

$d($  $,$  $)$

$$d(\texttt{odog}, \texttt{doge})$$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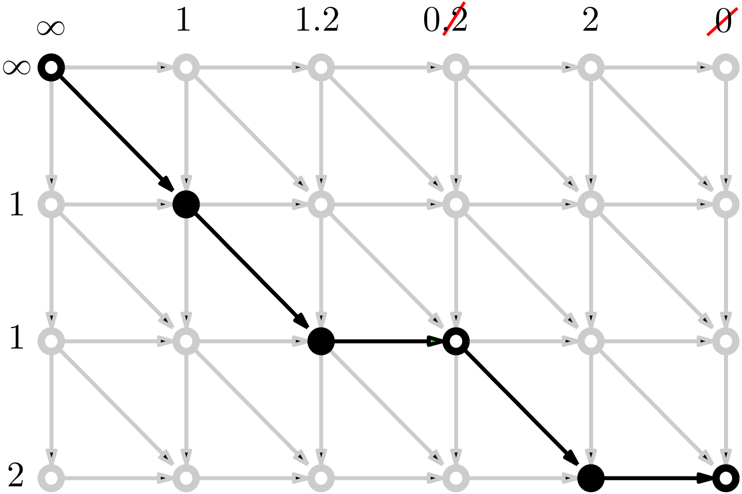
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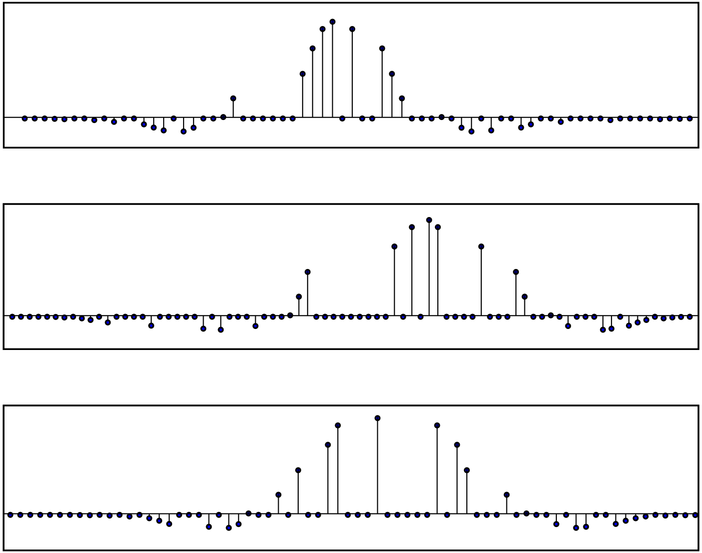
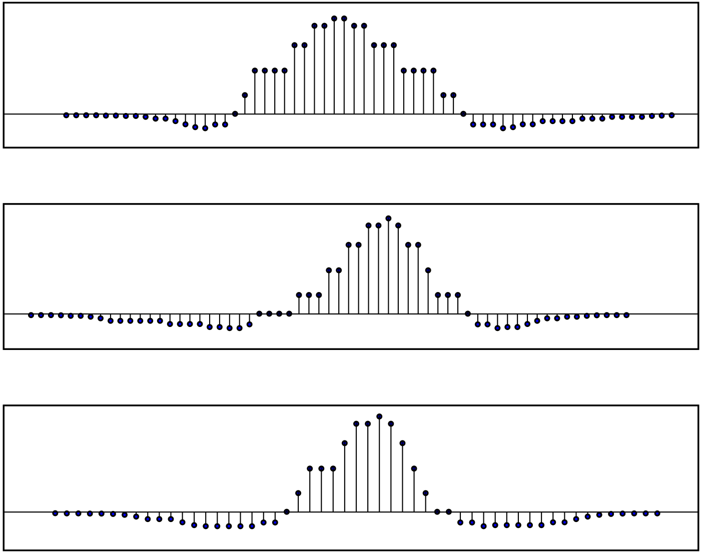
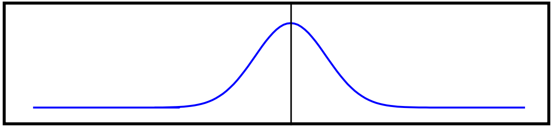




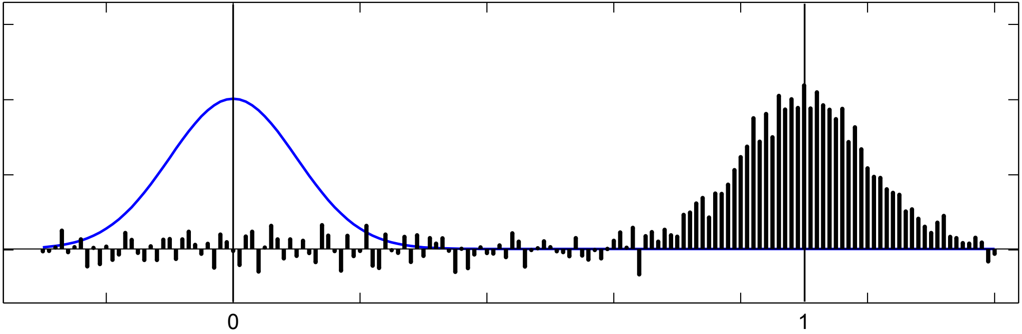
Part II:
Gauss Newton: A Cartoon

$F : t \mapsto$



$\in \Re^{150}$

$t \in \Re$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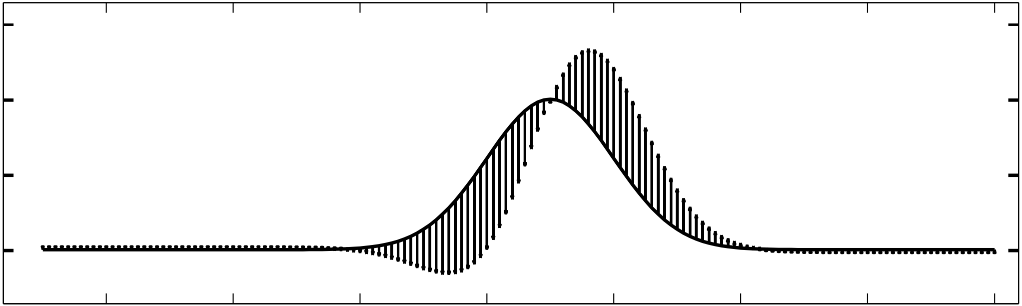
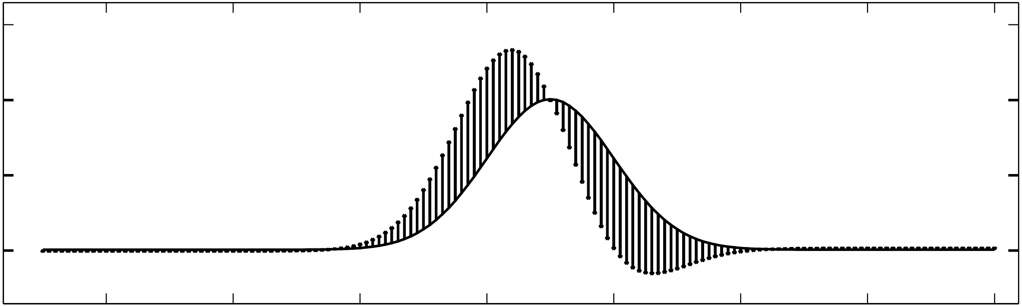
1

$$\text{minimize}_t \;\; \frac{1}{2}\|F(t)-b\|^2$$

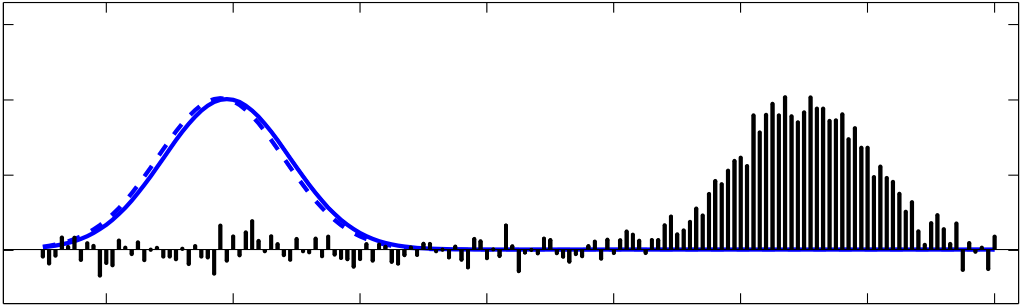
Linearization of F

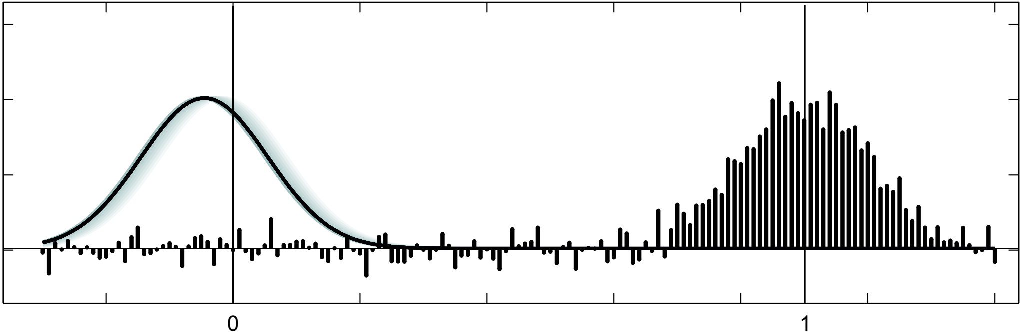


Linearization of F



$$t_{k+1} = \text{argmin}_t \frac{1}{2} \| F(t_k) + t J_F(t_k) - b \|^2$$

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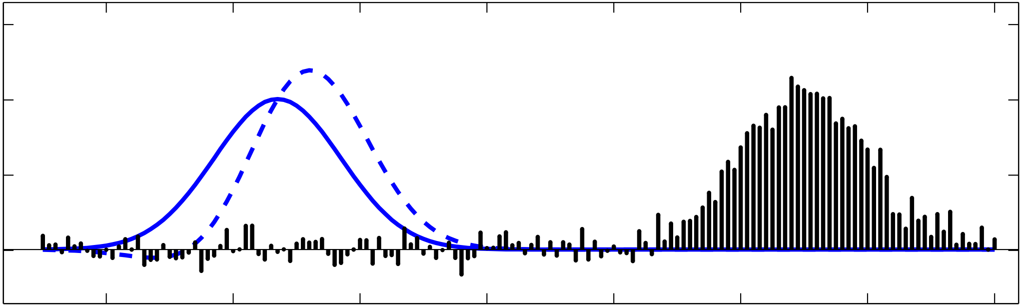
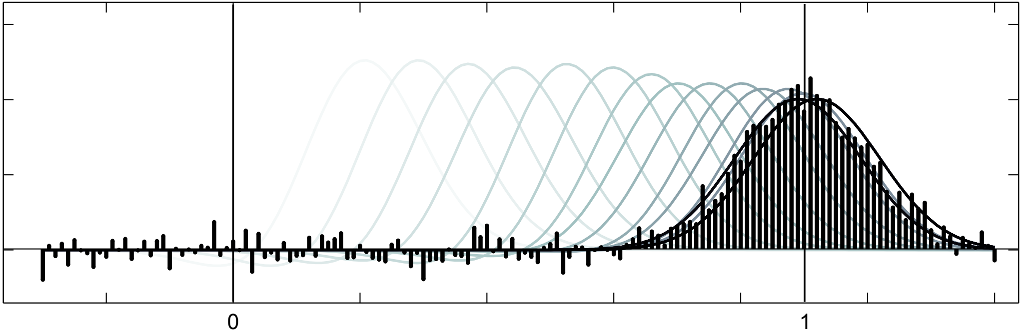
$$\text{minimize}_t \;\; d(F(t), b)$$

$$t_{k+1} = \operatorname{argmin}_t d(F(t_k) + tJ_F(t_k), b)$$

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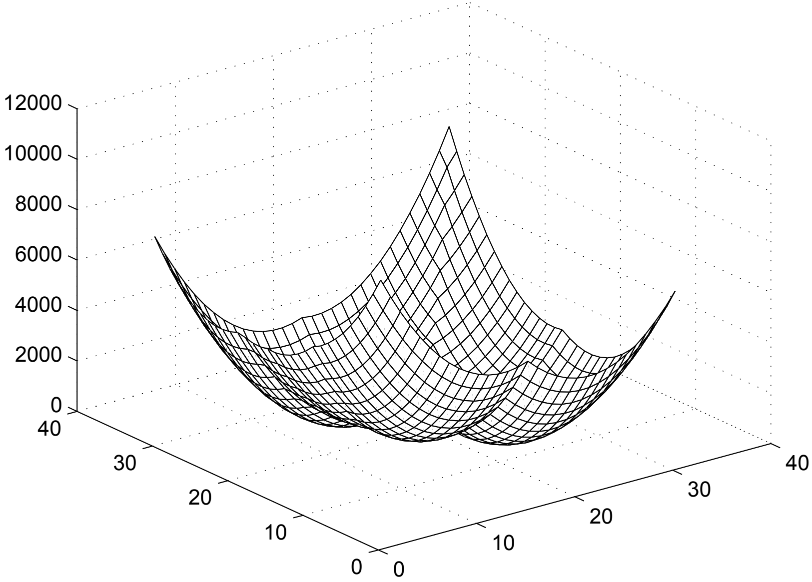
1

Part III:
A convex approximation to the Edit Distance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Computing the convex envelope of d

Step 1: Prove Best Lower Bound via the Fenchel Conjugate

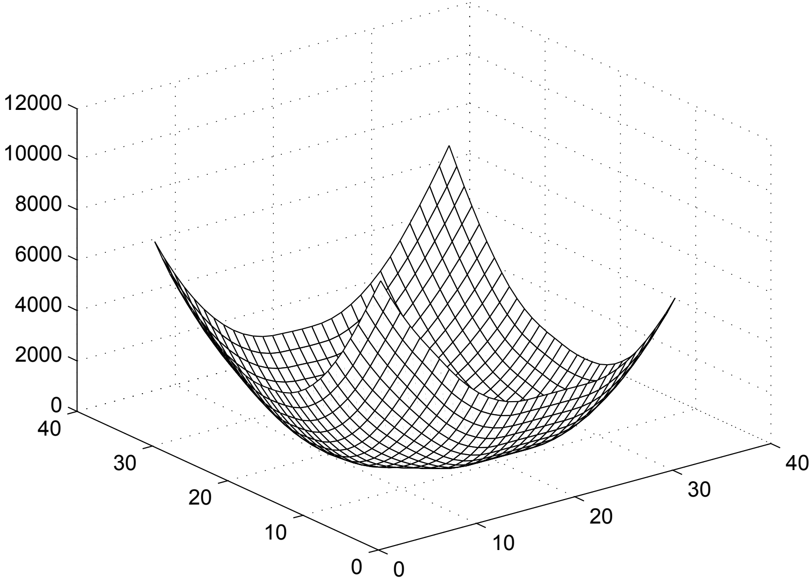
$$d(\cdot,y)^*(v) = \sup_x \{\langle x,v\rangle - d(\cdot,y)(x)\}$$

(use dynamic programming)

Step 2: Recover Approximation of d

$$d(\cdot,y)^{**}(x) = \sup_v \left\{\langle x,v\rangle - d(\cdot,y)^*(v)\right\}$$

(use iterative solver)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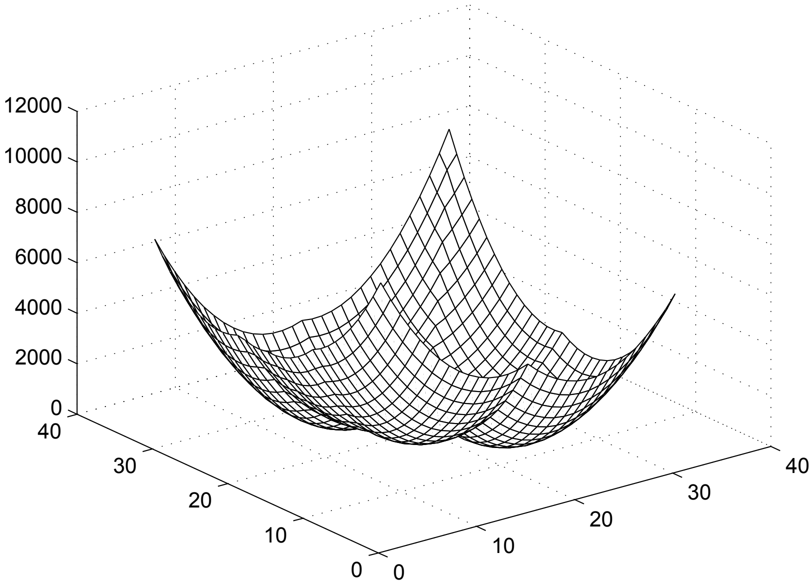
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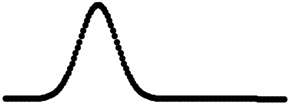
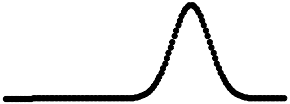
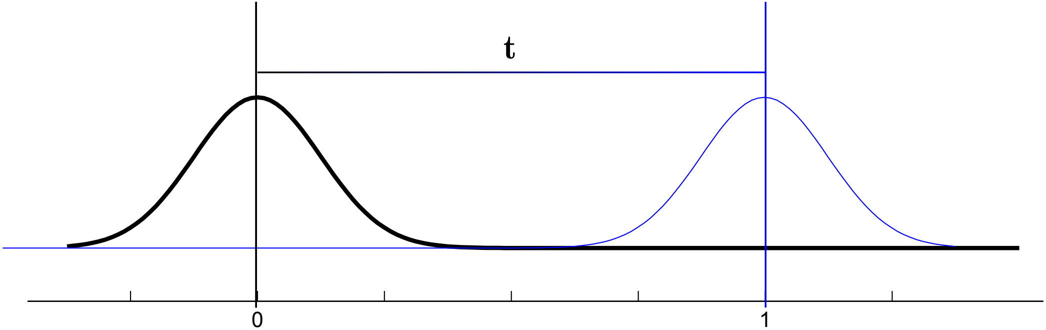
$d($  $,$  $)$


t
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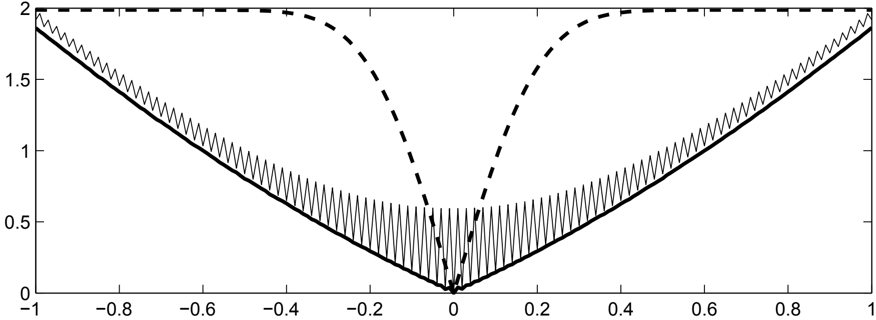
$\|F(t) - F(0)\|$ $\quad d(F(t), F(0))$ $\quad d(\cdot, F(0))^{**}(F(t))$



Acknowledgements!