Deep Accelerated Signal Processing (Week 7)

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Preconditioner - Motivation

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$x_{k+1} = x_k - \eta_k \nabla f(x_k)$

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Here, $[\nabla^2 f(x_k)]^{-1}$ can be replaced by a preconditioner

Preconditioner - Plan

Simplified version of Dr. Cai's Newton-Like Descent:

$$\boldsymbol{L}_{k+1} = \boldsymbol{L}_k - \eta_k \nabla_{\boldsymbol{L}} \ell(\dots)(\boldsymbol{R}_k^* \boldsymbol{R}_k)^{-1}$$

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$$\boldsymbol{L}_{k+1} = \boldsymbol{L}_k - \eta_k \nabla_{\boldsymbol{L}} \ell\left(\dots\right) \left(\boldsymbol{R}_k^* \boldsymbol{R}_k\right)^{-1}$$

Our Proposal:

$$\boldsymbol{L}_{k+1} = \boldsymbol{L}_k - \nabla_{\boldsymbol{L}} \ell\left(\dots\right) \boldsymbol{P}_k$$

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Our Proposal:

$$\boldsymbol{L}_{k+1} = \boldsymbol{L}_k - \nabla_{\boldsymbol{L}} \ell\left(\dots\right) \boldsymbol{P}_k$$

$$\boldsymbol{P}_k = \begin{bmatrix} \mathrm{p}_1 & 0 & \cdots & 0 \\ 0 & \mathrm{p}_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \mathrm{p}_r \end{bmatrix} \in \mathbb{R}^{r \times r}$$

where r is the rank of the Hankel matrix, and p_i is learnable

Dataset

I plan to focus on traffic data for my final report

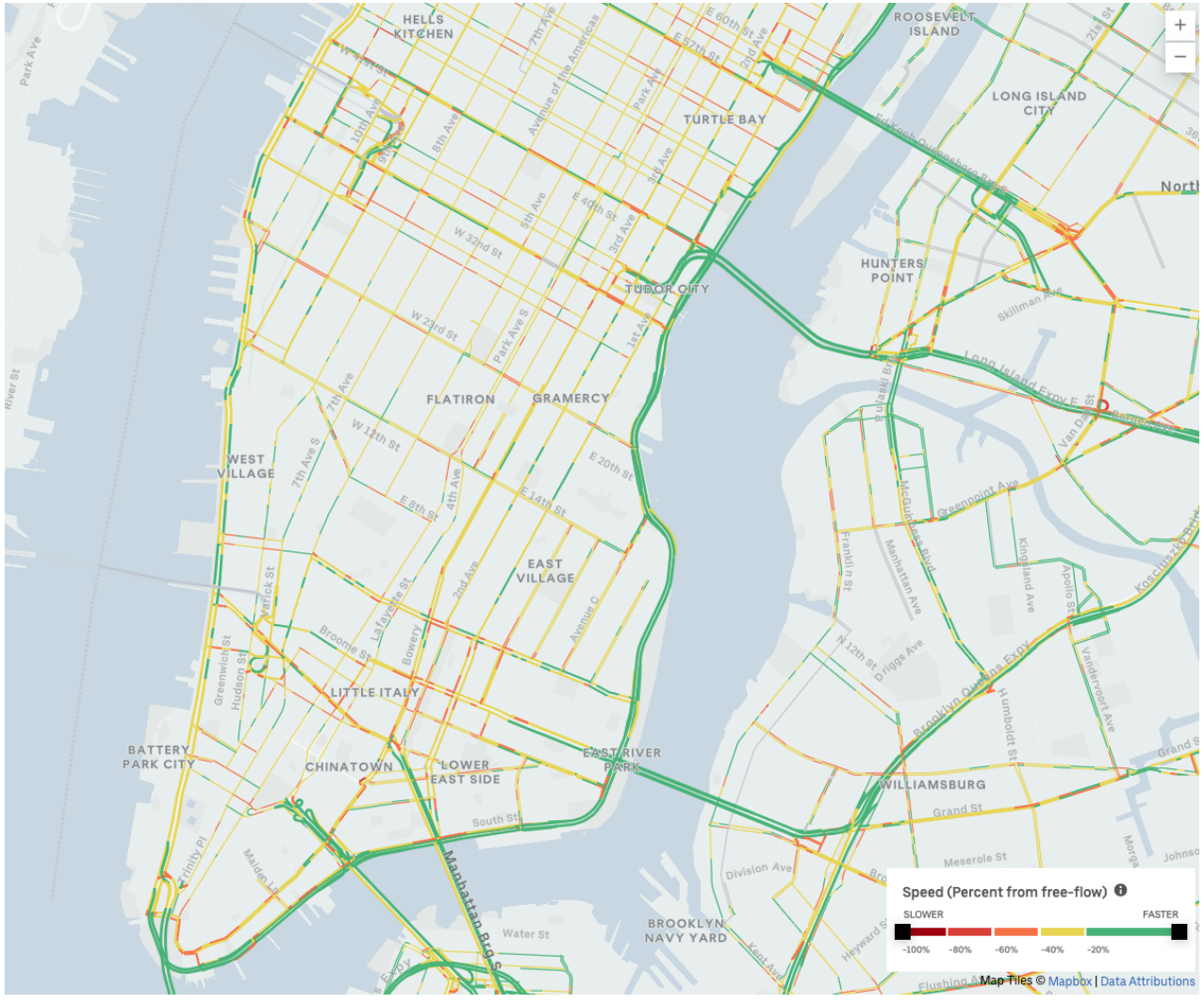


Figure: Heatmap of New York City speed data (Credit: Xinyu Chen)

Thank You!

Questions?