# My Recent Work

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# Outline

# Parameter Fitting

- Preview
- Parameters to Obserables
- Obserables to Parameters

# Preview

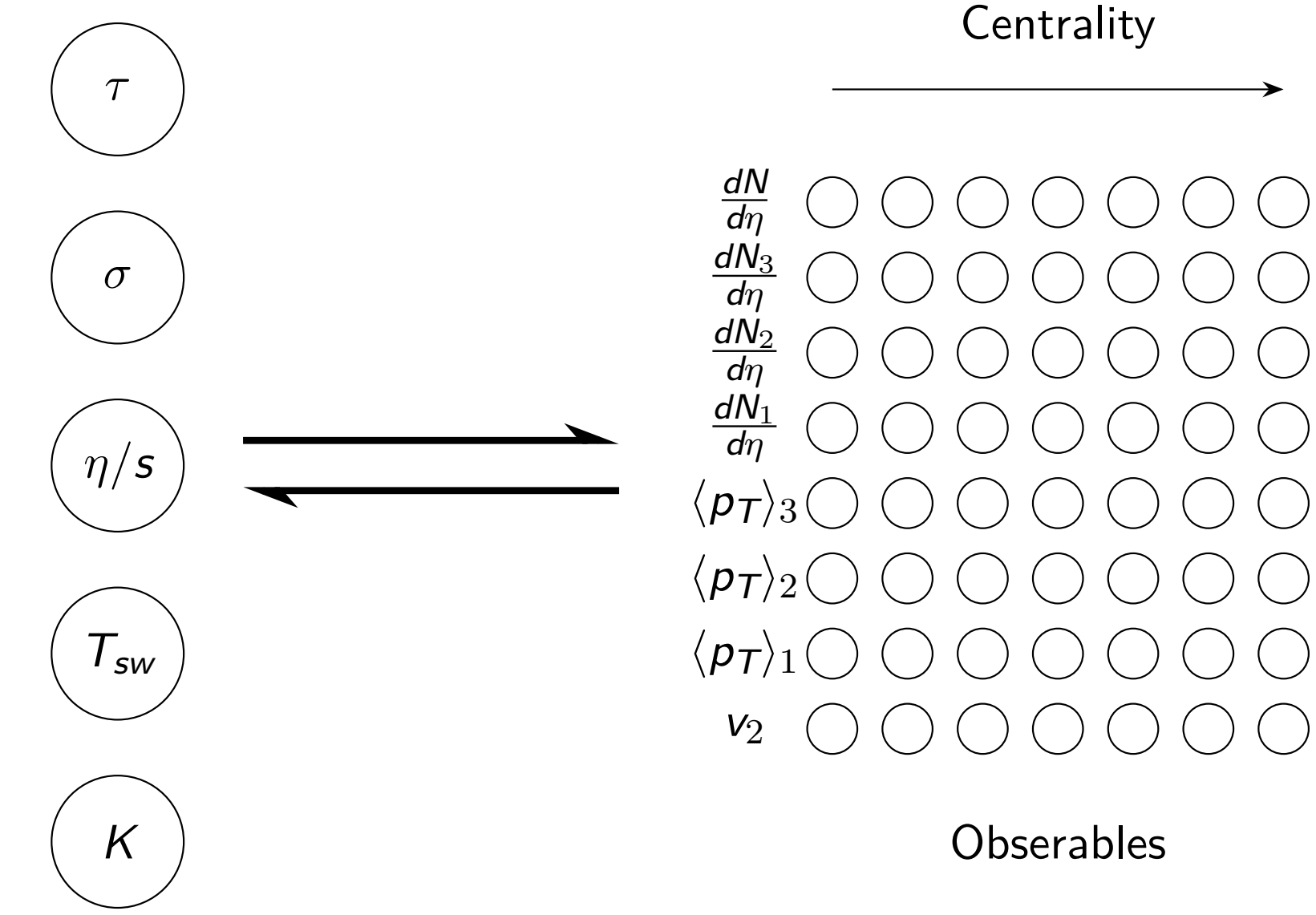
- Basic Information
- Target
- Data

# Basic Information

Basic Information

- Model:
  Collective ow in 2.76 A TeV and 5.02 A TeV Pb+Pb collisions
  Arxiv:1703.10792
- Motivation:
  Applying Bayesian parameter estimation to relativistic heavy-ion collisions: simultaneous characterization of the initial state and quark-gluon plasma medium
  Arxiv:1605.03954

# Target


Centrality
$\tau$
$\sigma$
$\eta/s$
$T_{sw}$
$K$
$\frac{dN}{d\eta}$
$\frac{dN_3}{d\eta}$
$\frac{dN_2}{d\eta}$
$\frac{dN_1}{d\eta}$
$\langle p_T \rangle_3$
$\langle p_T \rangle_2$
$\langle p_T \rangle_1$
$v_2$
Parameters
Obserables

# Data

- Initial:

| $\tau$ | $\sigma$ | $\eta/s$ | $T_{sw}$ | $K$ |
|---|---|---|---|---|
| 0.2 | 0.2 | 0.02 | 0.15 | 0.4 |
| 0.6 | 0.6 | 0.08 | 0.24 | 0.8 |
| 0.9 | 1.0 | 0.12 | 0.4 | 1.2 |

- Divide:

$$Total: 3^5 = 243 \Rightarrow \begin{cases} Train: 220 \\ Test: 23 \end{cases}$$

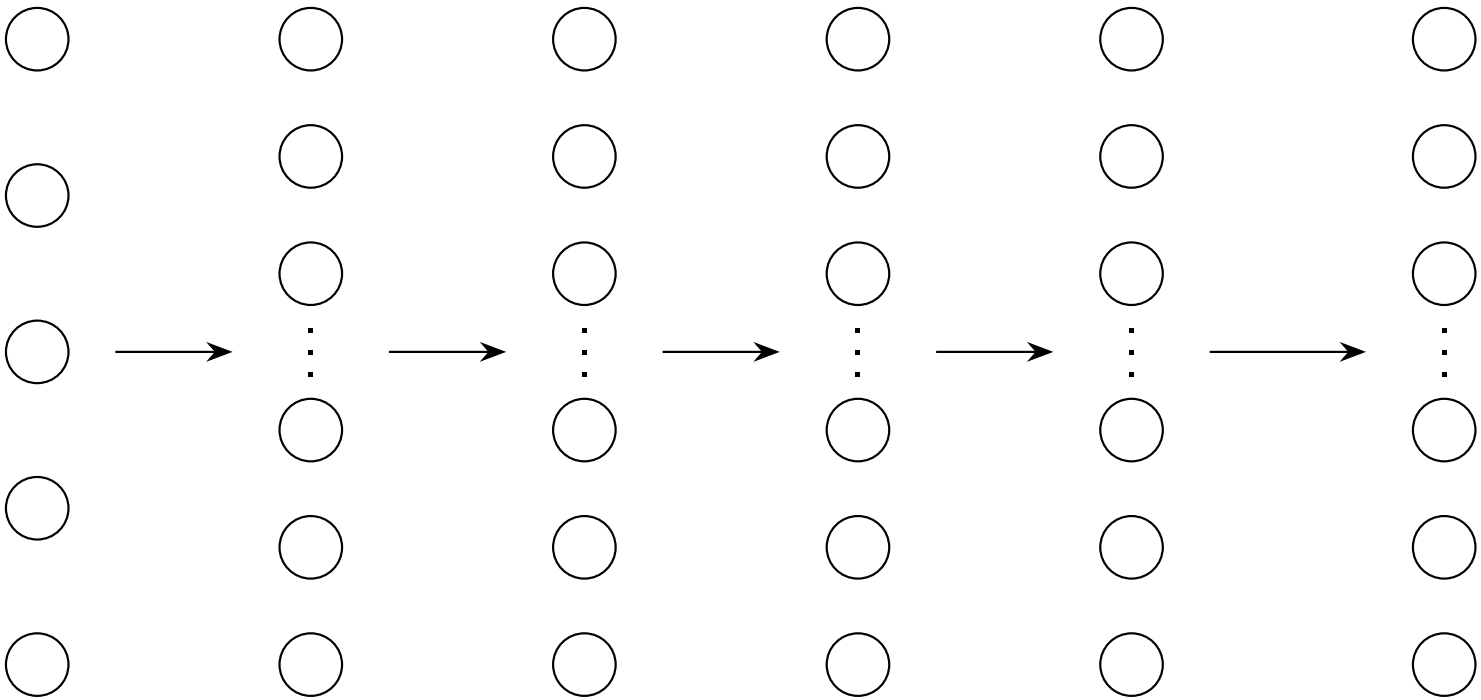
# Parameters to Obserables

- Network
- Result

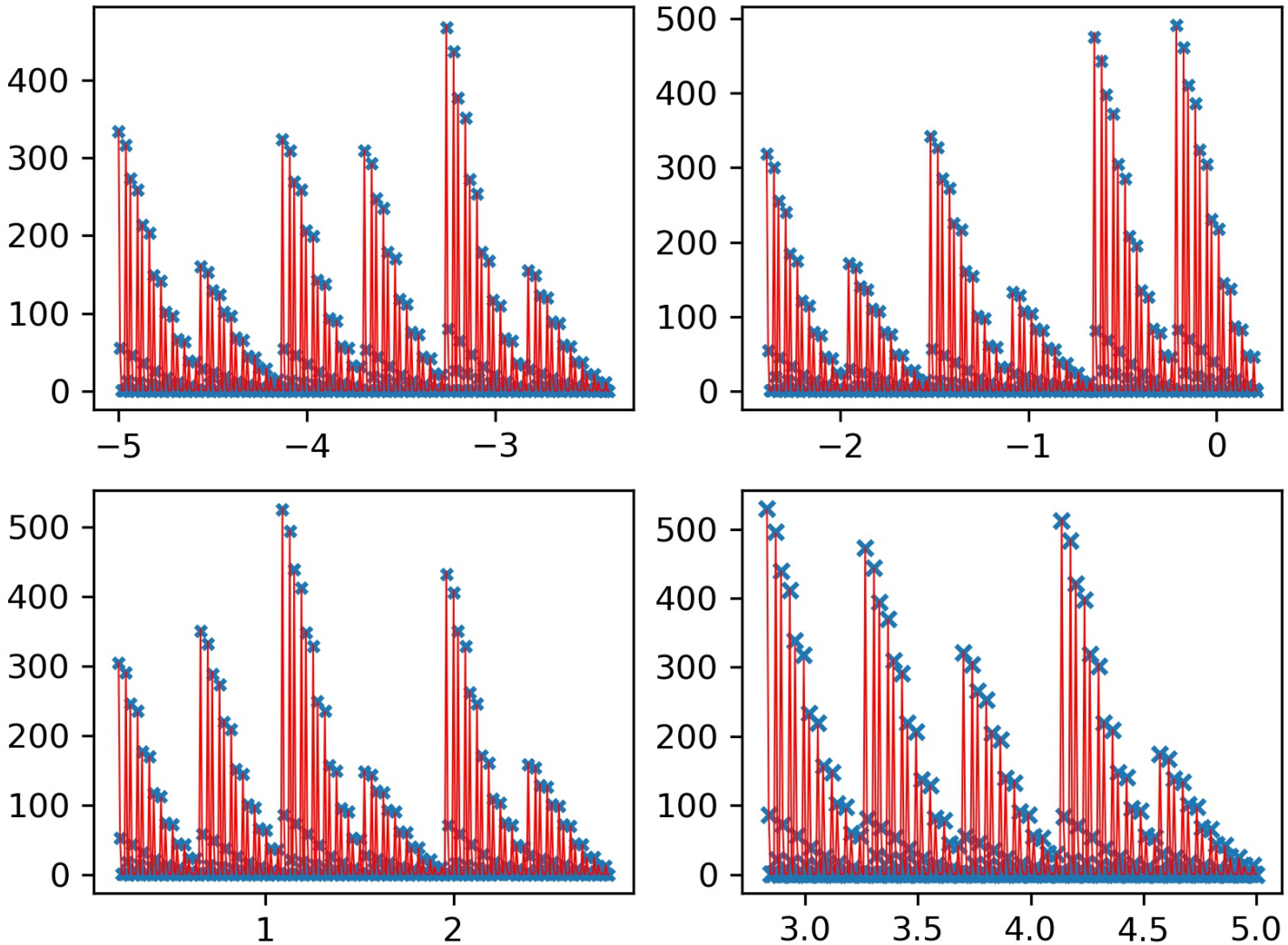
# Network

- Optimizer:Adam
- Learning rate:0.0005
- Loss:The L2 norm of the absolute error between the predictions and the labels
- Batch size:Randomly choose 44 of 220
- Layers' type:FC with dropout(p=0.5),activation function:relu
- Training times:200000

# Network


Parameter
128 units
128 units
128 units
128 units
Obserables

# Result


400
300
200
100
0
−5
−4
−3
500
400
300
200
100
0
−2
−1
0
500
400
300
200
100
0
1
2
500
400
300
200
100
0
3.0
3.5
4.0
4.5
5.0

# Result:Relative Error

表: Relative Error

| Obs \ Ctr | 2.5% | 7.5% | 15% | 25% | 35% | 45% | 55% |
|---|---|---|---|---|---|---|---|
| $\frac{dN}{d\eta}$ | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.04 |
| $\frac{dN_1}{d\eta}$ | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.05 | 0.05 |
| $\langle p_T \rangle_1$ | 0.04 | 0.02 | 0.04 | 0.04 | 0.06 | 0.05 | 0.05 |
| $\langle p_T \rangle_2$ | 0.04 | 0.05 | 0.03 | 0.03 | 0.05 | 0.04 | 0.04 |
| $\langle p_T \rangle_3$ | 0.02 | 0.08 | 0.03 | 0.04 | 0.09 | 0.10 | 0.16 |
| $\frac{dN_2}{d\eta}$ | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.04 |
| $\frac{dN_3}{d\eta}$ | 0.03 | 0.05 | 0.04 | 0.04 | 0.06 | 0.07 | 0.13 |
| $v_2$ | 1.17 | 1.34 | 0.63 | 0.72 | 0.94 | 0.36 | 1.18 |

# Obserables to Parameters

- Network
- Result

# Network

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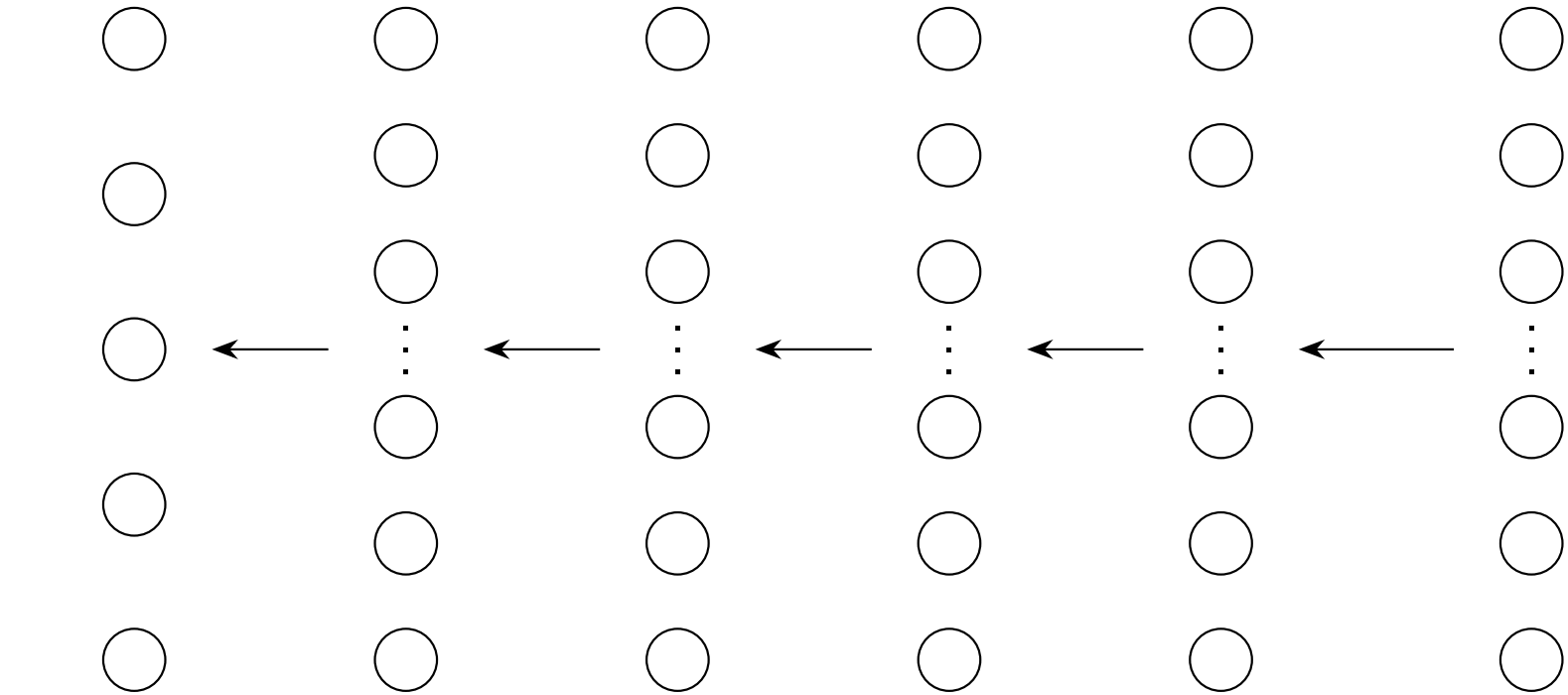
# Network


Parameter
256 units
256 units
256 units
256 units
Obserables

# Result:Relative Error

表: Relative Rror

| $\tau$ | $\sigma$ | $\eta/s$ | $T_{sw}$ | $K$ |
|---|---|---|---|---|
| 0.053011 | 0.201948 | 1.538553 | 0.065286 | 0.059904 |

# Reinforcement Learning

Studying something basic like Boltzmann's Equation, Fluid Mechanics...

Thank you for listening!