

My Recent Work

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Outline

Parameter Fitting

Reinforcement Learning

Parameter Fitting

- ▶ Preview
- ▶ Parameters to Observables
- ▶ Observables to Parameters

Preview

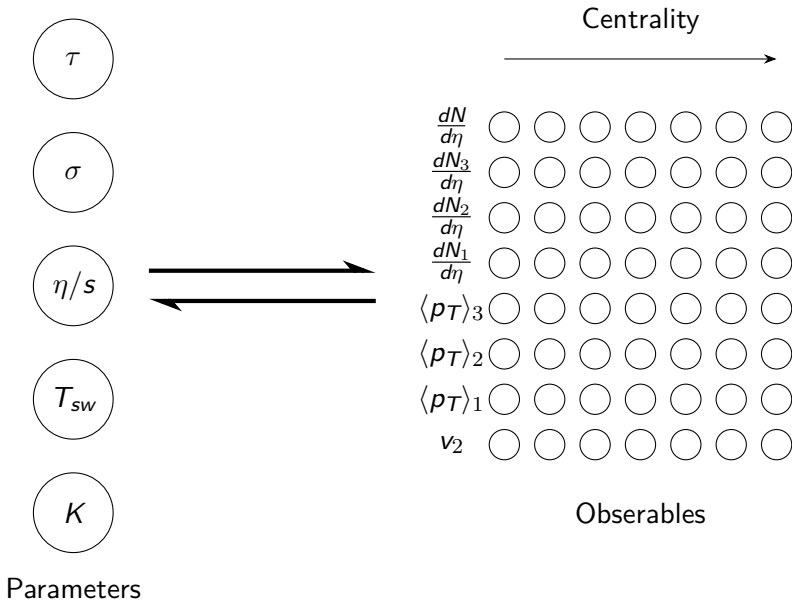
- ▶ Basic Information
- ▶ Target
- ▶ Data

Basic Information

Basic Information

- ▶ Model:
Collective flow 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



Data

► Initial:

τ	σ	η/s	T_{sw}	K
0.2	0.2	0.02	0.15(140MeV)	0.4
0.6	0.6	0.08	0.24(148MeV)	0.8
0.9	1.0	0.12	0.4(158MeV)	1.2

► Divide:

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

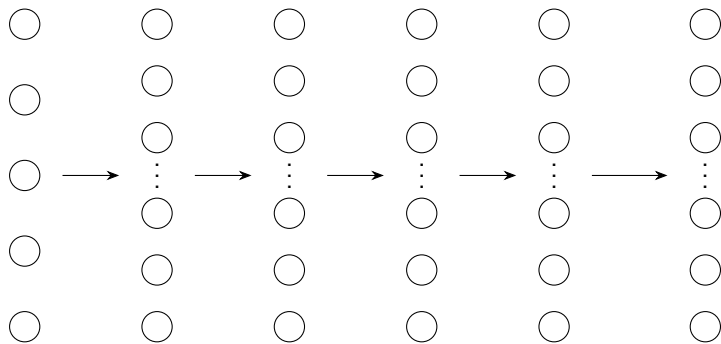
Parameters to Observables

- ▶ 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 Observables

Result: Relative Error

表: Relative Error

<div><div></div><div>Ctr</div><div>Obs</div></div>	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

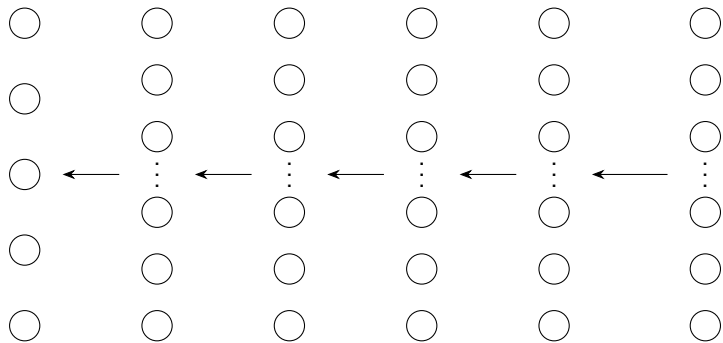
Observables to Parameters

- ▶ Network
- ▶ Result

Network

- ▶ Optimizer:Adam
- ▶ Learning rate:0.0005
- ▶ Loss:The L2 norm of the absolute error between the predictions and the labels
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- ▶ Training times:200000

Network



Parameter 256 units 256 units 256 units 256 units Observables

Result: Relative Error

表: Relative Error

τ	σ	η/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!