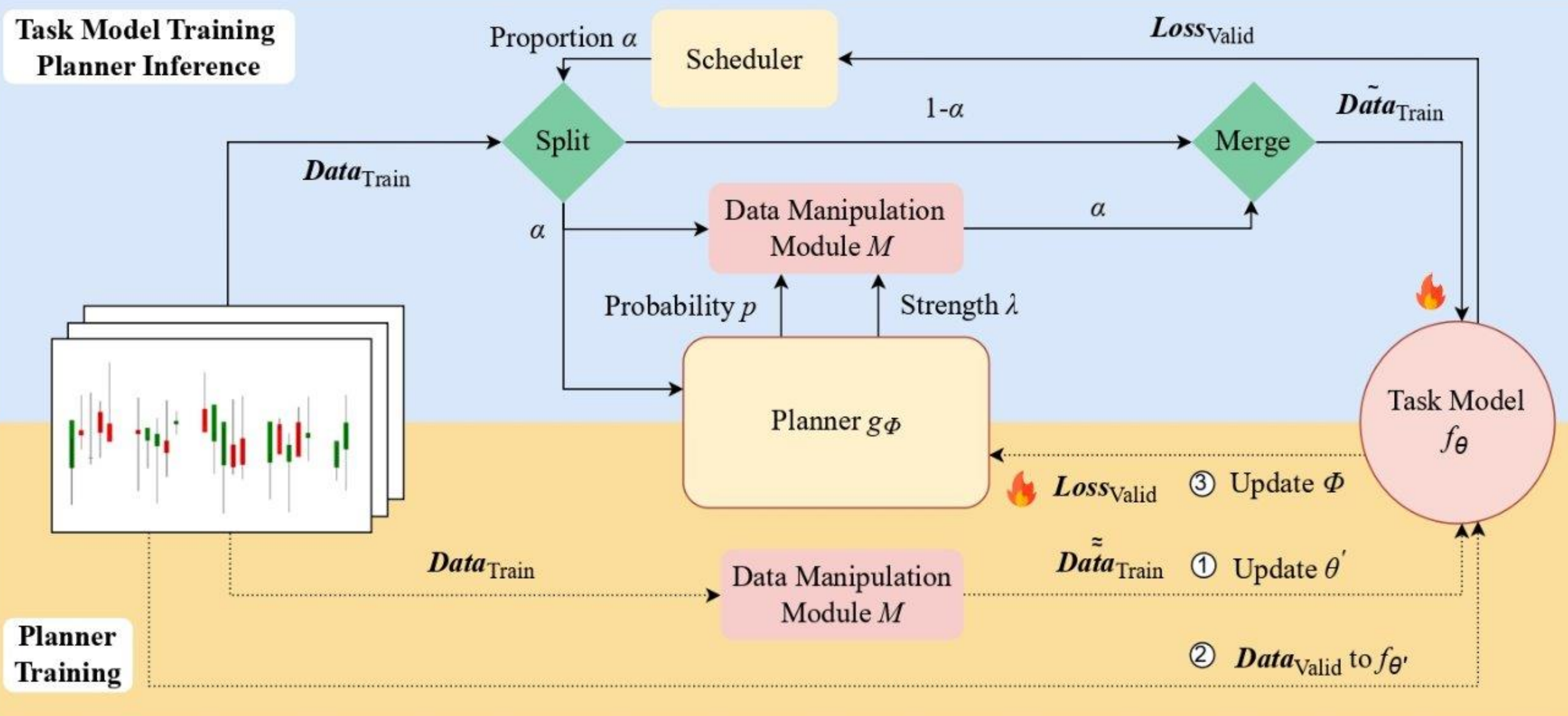


# SCSE23-0800: History Is Not Enough: Adaptive Financial Data Augmentation with a Curriculum Planner

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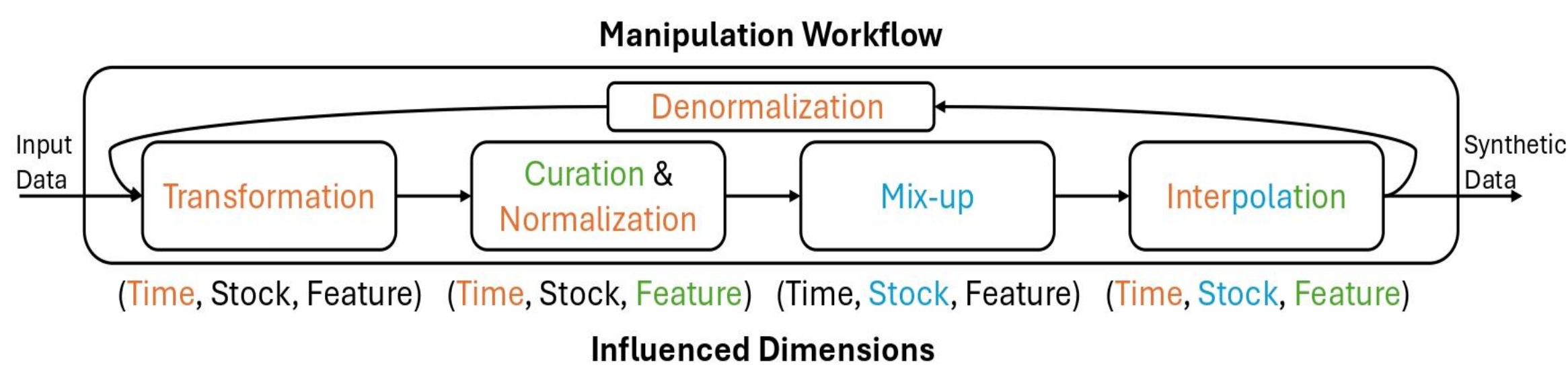


**Project Objectives:** Tackle the discrepancy between train and test performance due to concept drift in financial data.

## Key features:

- **Data manipulation module**
  - Single-stock transformation,
  - Multi-stock mix-up,
  - Data curation techniques
- **The curriculum planner**
  - Dynamically adjusts the manipulation of training samples based on the state of the data and the task model.
- **Bi-level optimisation**

$$\begin{aligned} \min_{\phi} \quad & \mathcal{L}_{val}(f_{\theta}, x_{valid}), \quad x_{valid} \in D_{valid} \\ \text{s.t.} \quad & \theta = \arg \min_{\theta} \mathcal{L}_{train}(f_{\theta}, \tilde{x}_{train}) \\ & \tilde{x}_{train} = M(x_{train}, \alpha, p, \lambda) \end{aligned}$$



## Forecasting experiment results:

Method	GRU			LSTM			Dlinear		
	MSE	MAE	STD	MSE	MAE	STD	MSE	MAE	STD
Original	22.76	3.388	5.140	5.070	1.578	1.664	52.15	5.501	9.601
RandAug	16.74	2.864	3.994	4.646	1.495	1.613	662.7	19.86	116.7
TrivialAug	15.62	2.670	4.114	4.827	1.536	1.634	571.6	18.40	100.7
AdaAug	17.64	2.972	3.995	4.791	1.538	<b>1.567</b>	22.62	3.803	3.234
Ours	<b>13.14</b>	<b>2.496</b>	<b>3.366</b>	<b>4.253</b>	<b>1.410</b>	1.571	<b>4.550</b>	<b>1.485</b>	<b>1.559</b>

Method	TCN			Transformer		
	MSE	MAE	STD	MSE	MAE	STD
Original	40.44	4.614	10.01	8.608	2.216	1.915
RandAug	58.74	4.925	22.12	8.264	2.160	1.892
TrivialAug	46.83	5.142	10.79	7.474	2.041	1.814
AdaAug	49.61	5.203	11.61	7.602	2.062	1.819
Ours	<b>34.87</b>	<b>4.341</b>	<b>7.864</b>	<b>7.471</b>	<b>2.046</b>	<b>1.795</b>

## Policy transfer to RL tasks:

Method	MCD		IBM		INTC	
	TR↑	SR↑	TR↑	SR↑	TR↑	SR↑
DQN	4.78	5.06	13.21	13.55	35.99	16.80
DQN + Ours	17.73	25.74	13.88	14.80	33.35	21.60
PPO	15.42	21.01	-3.62	-7.43	34.67	17.49
PPO + Ours	18.13	26.31	-2.80	-5.68	52.91	23.45