

A Additional Experiment Details

A.1 CLUTTR and CFQ Dependency Parsing

The experiments were performed using a cluster of 12 GPUs (2 24GB, 2 12GB, 8 11GB). A single training run on CFQ or CLUTRR requires less than 30 minutes on a single GPU. Hyperparameters were selected using grid search. For both the Edge Transformer and (Relation-aware) Transformer models, hyperparameter search was the same. The number of units were varied between 200-400; batch size between 40 and 400 (for CLUTRR) and $5 \cdot 10^3$ and $1 \cdot 10^4$ words (for CFQ). Learning rates varied between $1 \cdot 10^{-4}$ and $2 \cdot 10^{-3}$, and the number of heads varied from between 4 and 8. For Transformer models, the number of layers varied from 5 to 8. For Edge Transformer models, the number of layers was varied from 6 to 8.

Hyperparameters for CLUTRR (for ET, baselines, and ablations) were optimized on the $k = 2, 3$ task, and fixed for the $k = 2, 3, 4$ task. For CFQ dependency parsing, hyperparameters were optimized on a 1% random subset of the official random split (Keysers et al., 2020), and fixed for the MCD splits.

A.2 CFQ Semantic Parsing

When tuning the Universal Transformer baseline we varied the number of layers from 2 to 6, the learning rate from 0.0001 to 0.001, the batch size of 64 to 128 and the number of epochs on the 20K random split training examples from 200 to 400. The number of heads was fixed to 8. For training on MCD splits with $\sim 90K$ training examples each we divided the number of epochs by 4 to keep the total number of training steps approximately the same. We found that longer training gave better results, hence all results in the paper are obtained with 100 training epochs.

A.3 COGS Semantic Parsing

No hyperparameter search was performed for Edge Transformer on COGS. Architecture hyperparameters for Edge Transformer were matched to those of (Ontanón et al., 2021), who tuned the number of layers, hidden dimension, feed-forward dimension, and number of heads for their Transformer architectures. Their best Transformer model has two standard layers and a separate attention head for output, giving three QK attention layers total. We therefore use three layers for Edge Transformer. Default settings were used for optimizer hyperparameters.

Checklist

1. For all authors...
 - (a) Do the main claims made in the abstract and introduction accurately reflect the paper’s contributions and scope? [Yes]
 - (b) Did you describe the limitations of your work? [Yes] See Section 6.
 - (c) Did you discuss any potential negative societal impacts of your work? [No]
 - (d) Have you read the ethics review guidelines and ensured that your paper conforms to them? [Yes]
2. If you are including theoretical results...
 - (a) Did you state the full set of assumptions of all theoretical results? [N/A]
 - (b) Did you include complete proofs of all theoretical results? [N/A]
3. If you ran experiments...
 - (a) Did you include the code, data, and instructions needed to reproduce the main experimental results (either in the supplemental material or as a URL)? [Yes]
 - (b) Did you specify all the training details (e.g., data splits, hyperparameters, how they were chosen)? [Yes]
 - (c) Did you report error bars (e.g., with respect to the random seed after running experiments multiple times)? [Yes]
 - (d) Did you include the total amount of compute and the type of resources used (e.g., type of GPUs, internal cluster, or cloud provider)? [Yes]

4. If you are using existing assets (e.g., code, data, models) or curating/releasing new assets...
 - (a) If your work uses existing assets, did you cite the creators? [Yes]
 - (b) Did you mention the license of the assets? [No]
 - (c) Did you include any new assets either in the supplemental material or as a URL? [No]
 - (d) Did you discuss whether and how consent was obtained from people whose data you're using/curating? [N/A]
 - (e) Did you discuss whether the data you are using/curating contains personally identifiable information or offensive content? [N/A]
5. If you used crowdsourcing or conducted research with human subjects...
 - (a) Did you include the full text of instructions given to participants and screenshots, if applicable? [N/A]
 - (b) Did you describe any potential participant risks, with links to Institutional Review Board (IRB) approvals, if applicable? [N/A]
 - (c) Did you include the estimated hourly wage paid to participants and the total amount spent on participant compensation? [N/A]