

Automated GUI Widgets Classification

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Problems & Ideas

❖ Problems:

- Prior work on widgets classification primarily used mature methods from the computer vision domain, which involved manually designing the model architecture.
- Manually designing the architecture takes a long time and demands a certain amount of skill.
- Therefore, an approach to automating the process is crucial.

❖ Ideas:

- This paper presents the NASW approach for automating model architecture design and generating a widget classification model from a labelled widget dataset.
- The proposed NASW automatically generates a high-performance classification model $NASW_m$ using Neural Architecture Search (NAS) capabilities.
- The NASW approach can greatly save architecture design time and improve classification performance.
- The NASW model can be used to support GUI code generation task.

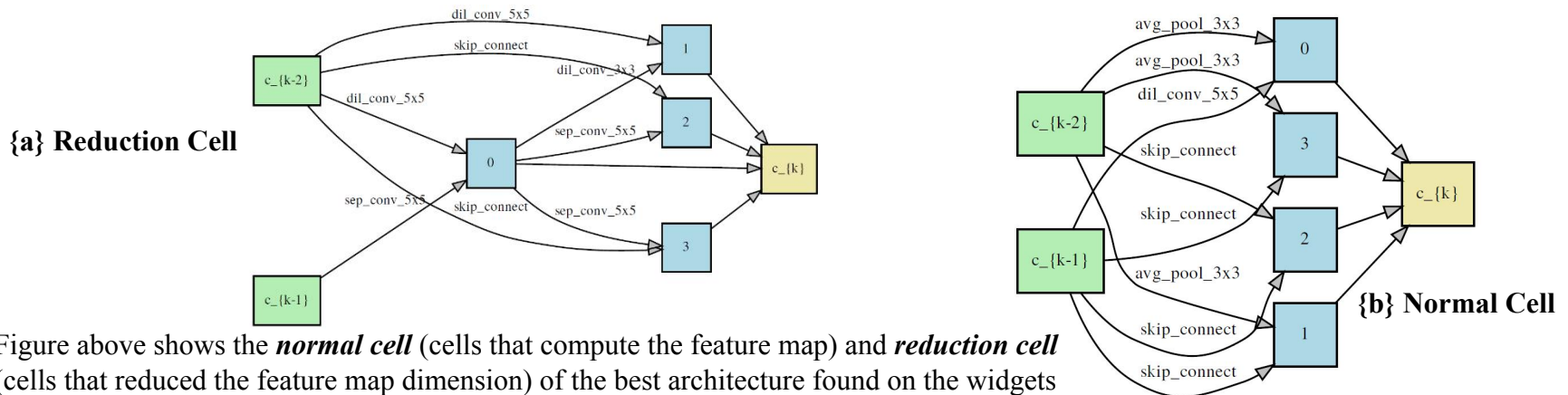


Figure above shows the *normal cell* (cells that compute the feature map) and *reduction cell* (cells that reduced the feature map dimension) of the best architecture found on the widgets dataset.

Main Contributions

❖ Contributions:

- We proposed an approach called NASW for searching an exquisite network architecture for GUI widget classification, which explores the potential of the NAS algorithm in automating software engineering tasks.
- The searched architecture based on NASW not only attains state-of-the-art performance, but the time spent to search and train the architecture is also significantly reduced.
- We constructed a standard dataset with a total of 15 classes and 5k samples in each class to mitigate the noise and the class imbalance in the original large GUI widgets dataset. The code, standard dataset, and trained models are available at our GitHub repository: <https://github.com/talk2kabir/NASW>

Architecture Search Performance

Architecture	Seed	Accuracy	Time (Min)	Param.
NASW	0	84.15	57.13	2.47 MB
NASW1	1	82.49	57.31	3.93 MB
NASW2	2	83.93	55.27	3.85 MB
NASW3	3	83.51	54.16	3.49 MB
NASW4	4	83.61	55.50	3.67 MB

Model Performance Comparison

Method	Accuracy	Precision	Recall	F1-score
ReDraw	0.834	0.913	0.554	0.690
BOVW	0.646	0.569	0.528	0.546
ResNet50	0.862	0.858	0.862	0.854
<i>NASW_m</i>	0.906	0.906	0.905	0.899

The proposed NASW approach takes less than an hour to obtain an optimal model architecture for widget classification. This shows the effectiveness of the NASW method in automating architecture engineering and, thus, reducing the time-consuming task of designing the architecture manually. Besides, the NASW architecture outperform the existing hand-crafted model architectures.