SPECTRAL-SPATIAL CLASSIFICATION OF HYPERSPECTRAL IMAGE BASED ON A JOINT ATTENTION NETWORK

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Motivations

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- **Attention Mechanism**
  - Focus on key pieces of feature space
  - Differentiate irrelevant information
  - Apply in language translation

★ Heighten the most valuable information

- **Attention Mechanism in Hyperspectral Image**
  - Spectral dimension —— Inner spectral correlations
  - Spatial domain——Spatial dependence and saliency features

Proposed Method

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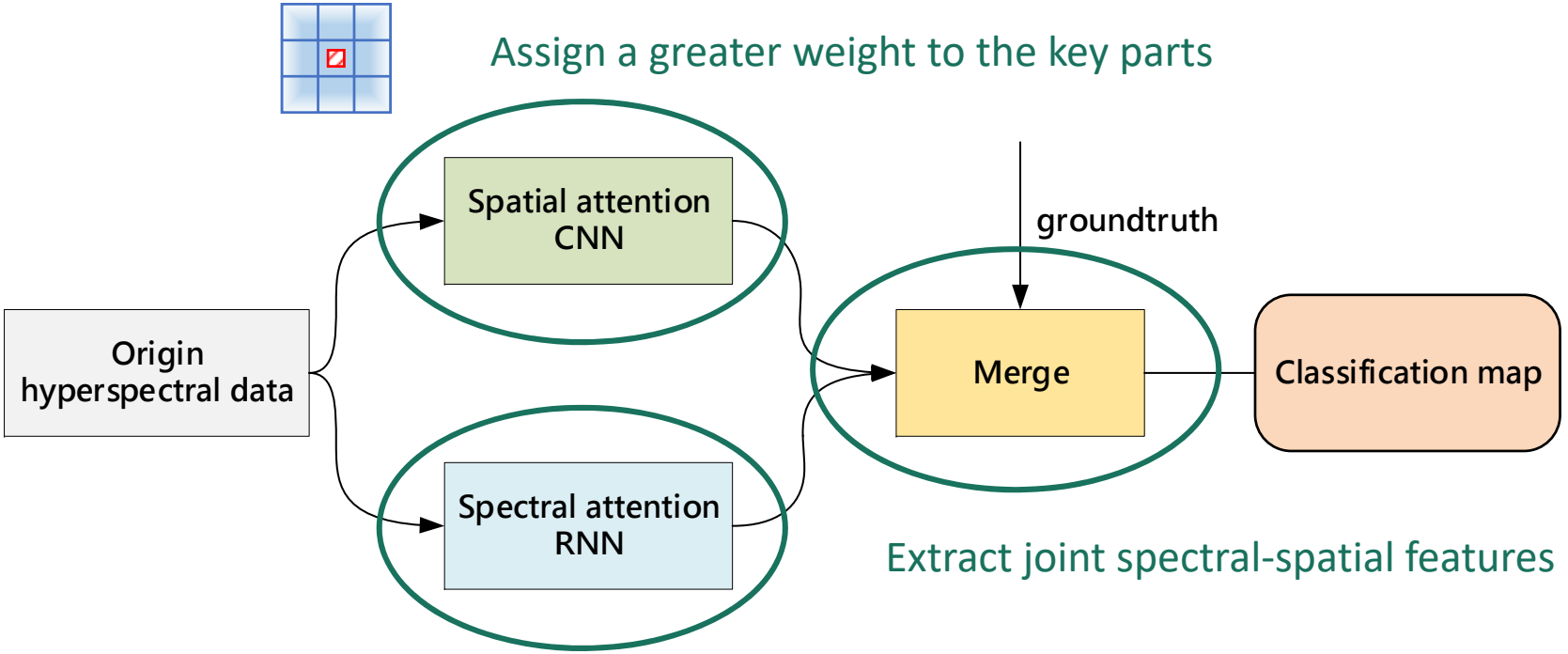
- Overall Architecture



Spectral Attention

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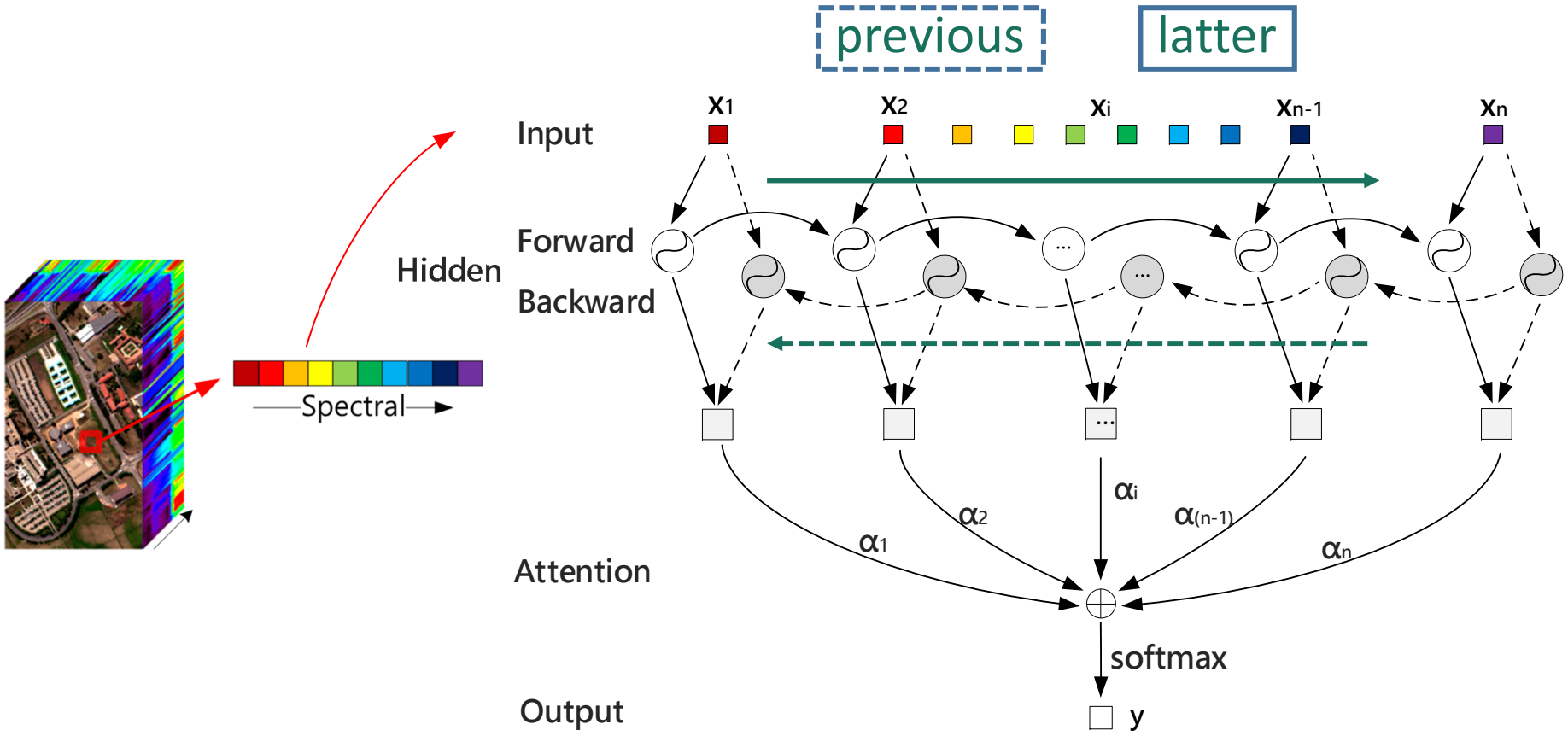

Spectral Attention

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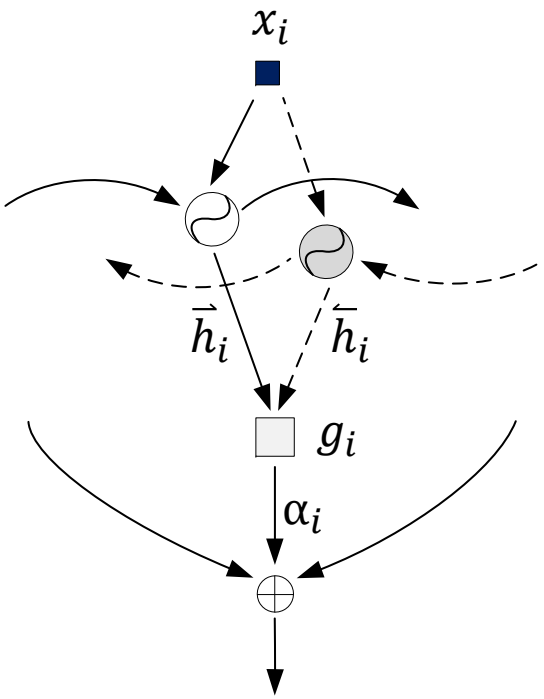

- $g_i = \text{concat}(\vec{h}_i + \overleftarrow{h}_i)$
- $e_i = \tanh(W_i g_i + b_i)$
- $\alpha_i = \text{softmax}(W_i' e_i + b_i')$

Spatial Attention

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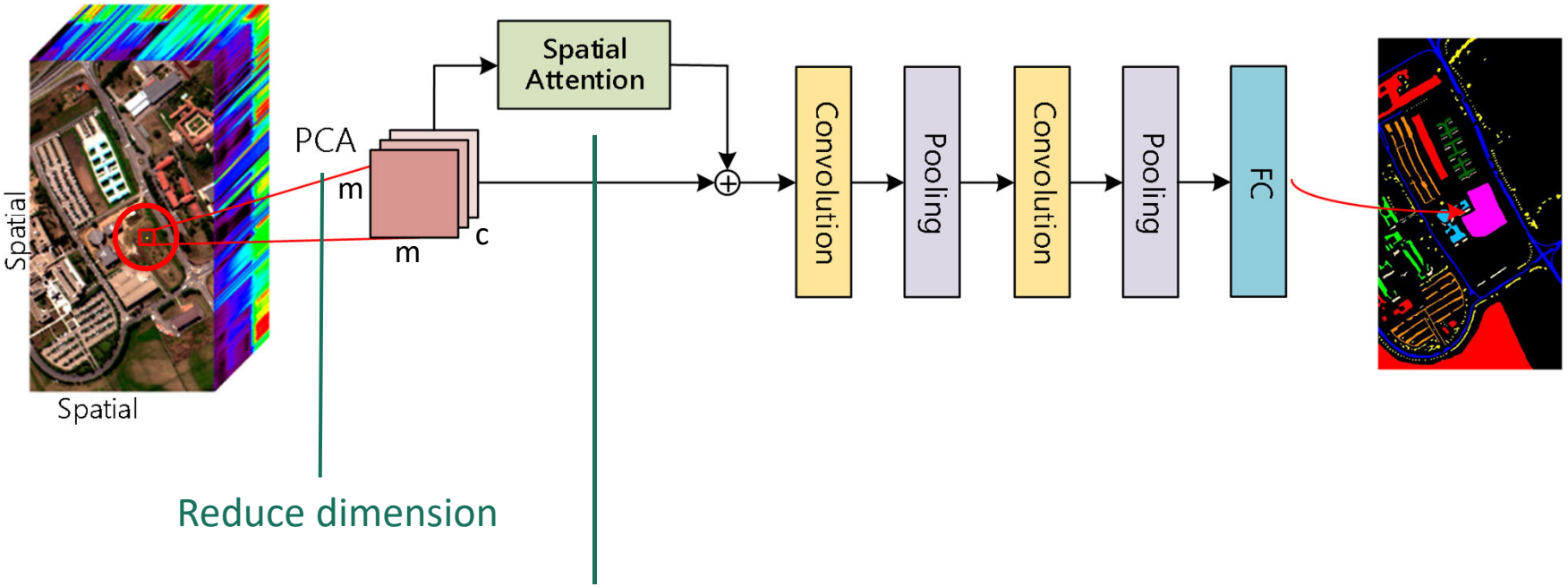

Spatial Attention

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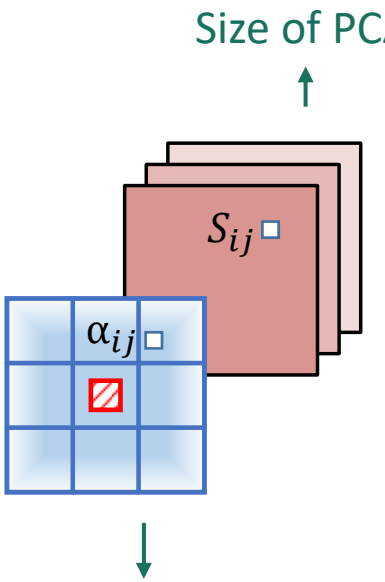

- $s_{ij} = \tanh\left(W_s \cdot S_{ij} + b_s\right)$
- $\alpha_{ij} = \mathrm{sigmoid}\left(W_z \cdot s_{ij} + b_z\right)$

Experimental settings

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- Compared Methods: KNN, SVM, CNN, RNN, ACNN, ARNN
- Training & Testing Set: Pavia University & Pavia Center
- Evaluate Criteria : OA, AA, kappa

Performance

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Table 1: Classification performance of different methods for the Pavia University dataset. Bold indicates the best result.

Label	KNN	SVM	RNN	CNN	ARNN	ACNN	SSAN
OA	84.48	84.43	91.2	89.20	96.54	92.61	**99.54**
AA	84.88	88.59	88.6	93.20	86.52	97.51	**98.41**
Kappa	83.0	79.94	89.3	85.91	90.90	82.01	**99.12**

Table 2: Classification performance of different methods for the Pavia Center dataset. Bold indicates the best result.

Label	KNN	SVM	RNN	CNN	ARNN	ACNN	SSAN
OA	92.5	93.05	92.3	86.20	99.47	96.38	**99.64**
AA	92.5	85.89	89.5	91.20	91.31	93.37	**98.06**
Kappa	91.6	90.18	91.4	68.91	98.41	94.83	**98.92**

Performance

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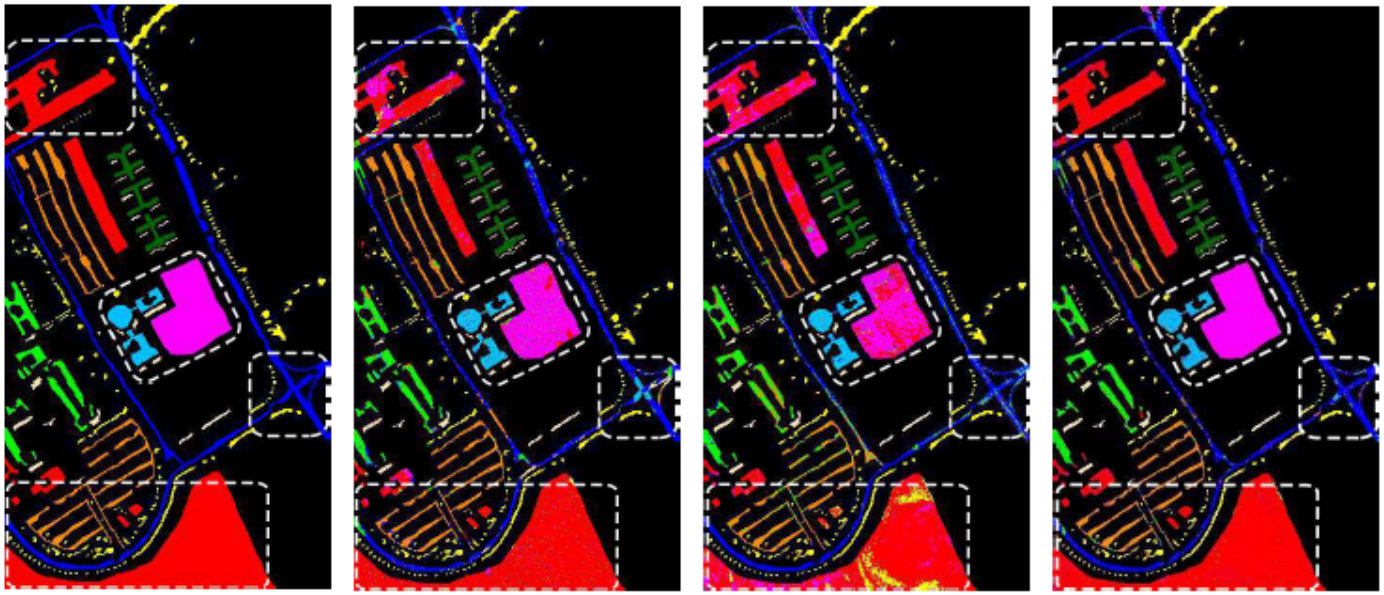

(a)groundtruth (b) ACNN (c) ARNN (d) SSAN

Performance

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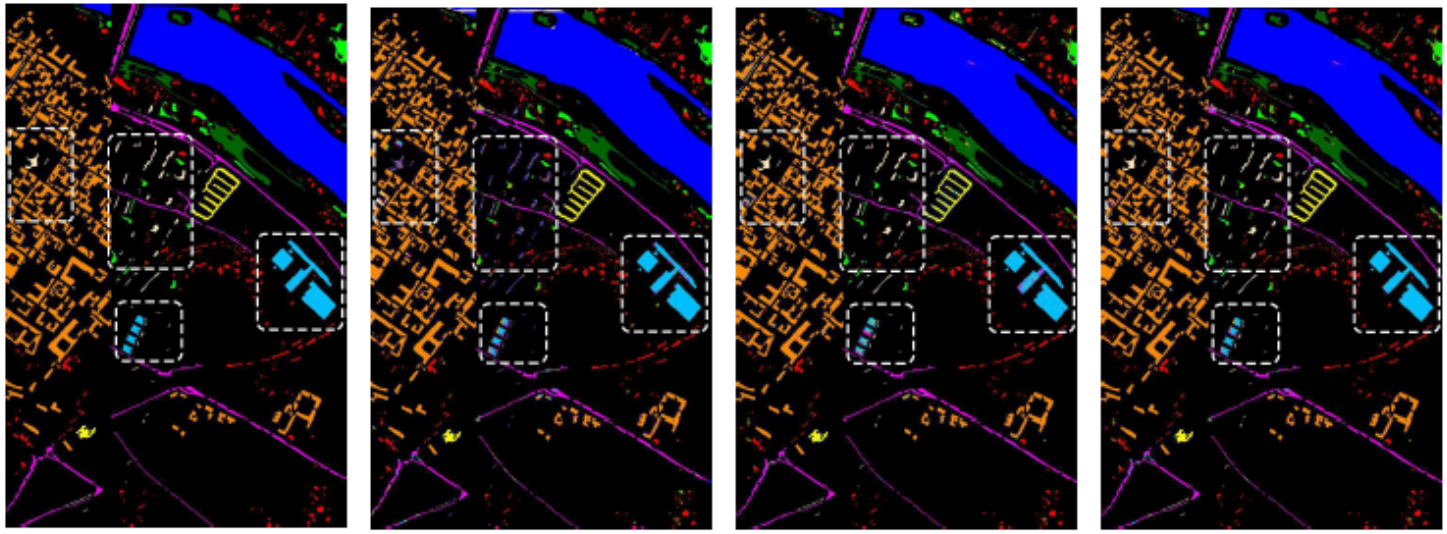

(a)groundtruth (b) ACNN (c) ARNN (d) SSAN

Conclusion

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- Propose a joint attention network.
- Introduce the attention mechanism for spectral features and spatial features.
- Outperform better, extract more homogeneous discriminative feature.

THANKS FOR YOUR ATTENTION

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