AMMAI Final

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Results

Models	miniImageNet	EuroSAT	ISIC
Baseline	67.87 ± 0.71% 68.10% ± 0.67%	/ 76.16 ± 0.72% 75.69% ± 0.66% / 79.08% ± 0.61%	/ 48.22 ± 0.61% 43.56% ± 0.60% / 48.11% ± 0.64%
Protonet	68.42 ± 0.63% 66.33% ± 0.65%	/ 81.79 ± 0.62% 77.45% ± 0.56% / 81.45% ± 0.63%	/ 46.12 ± 0.59% 41.73% ± 0.56% / 46.72% ± 0.59%
Compact	61.51 ± 0.66%	59.94 ± 0.81% / 79.56 ± 0.64%	41.76 ± 0.64% / 45.90 ± 0.61%
Sphere	58.04 ± 0.67%	67.76 ± 0.71% / 59.90 ± 0.82%	37.68 ± 0.54% / 42.01 ± 0.61%
Feature Generation	66.54 ± 0.68%	/ 80.78 ± 0.58%	/ 46.17 ± 0.59%

*number in blue is the result in README of sample code

Protonet + Compact Loss

- Protonet + additional loss
- Each support image is mapped as close to their mean (prototype).
- Not so effective.

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Large Margin on Sphere

- Each image is embedded on a 512-dim sphere.
- Distances are measured using cosine.
- Training with margin proves hard, not applicable in protonet-like training.

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Feature Generation

- Implementation of “Diversity Transfer Network for Few-Shot Learning” on AAAI 2019
  - Chen, Mengting, et al. "Diversity Transfer Network for Few-Shot Learning." *arXiv preprint arXiv:1912.13182* (2019).
- Source code released by Authors
  - https://github.com/Yuxin-CV/DTN.
- Source code used on the final project
  - https://github.com/shiannn/AMMAI-Final-FG
  - Vectorize computing classifiers from support samples
  - Extra dataloader for referenced images

Feature Generation

- Using random seed
  - np.random.seed(10) & torch.manual_seed(20)
- For each support/query sample, we generate 6 reference pairs
- Little bits exceed the result of Protonet on miniimageNet of README
- Little bits exceed the result of Protonet on ISIC of re-run
- Excceed the result of Baseline on EuroSAT with ~1.7%

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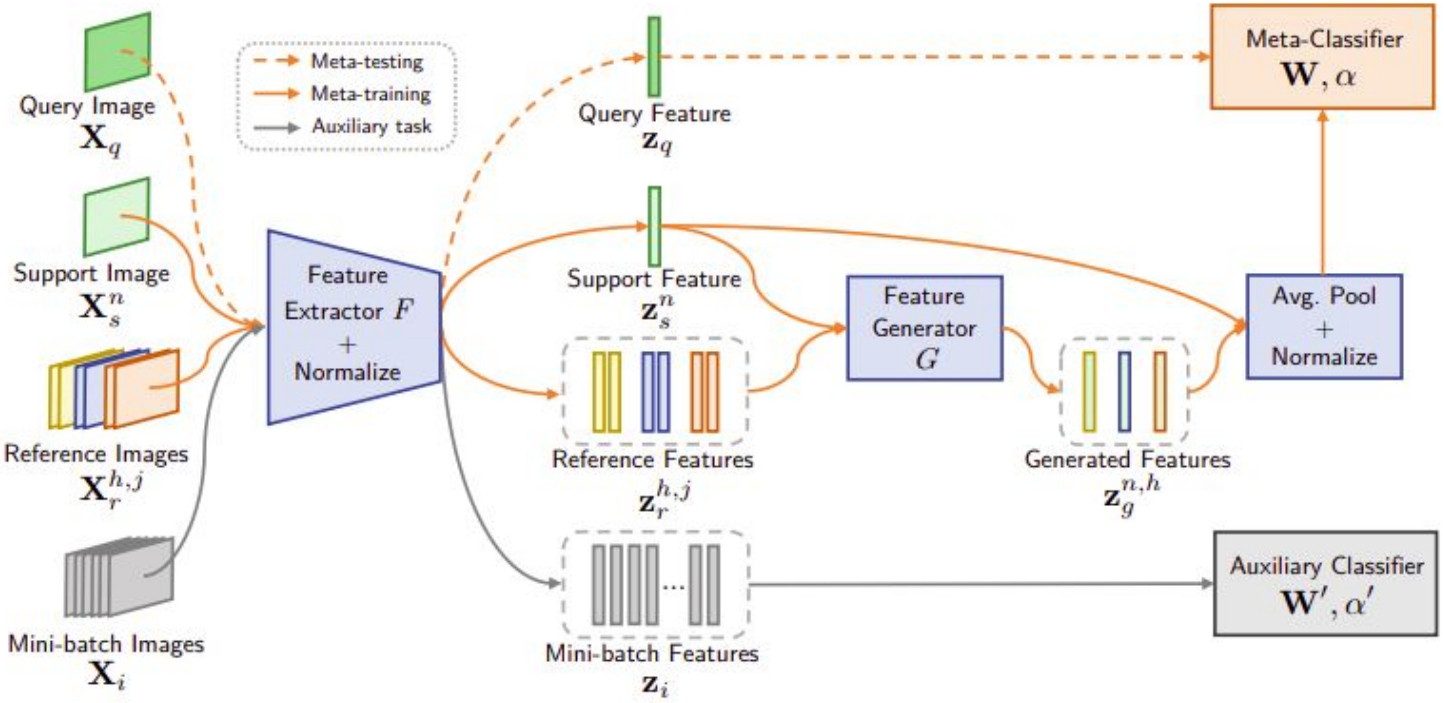
Feature Generation - via Diversity Transfer

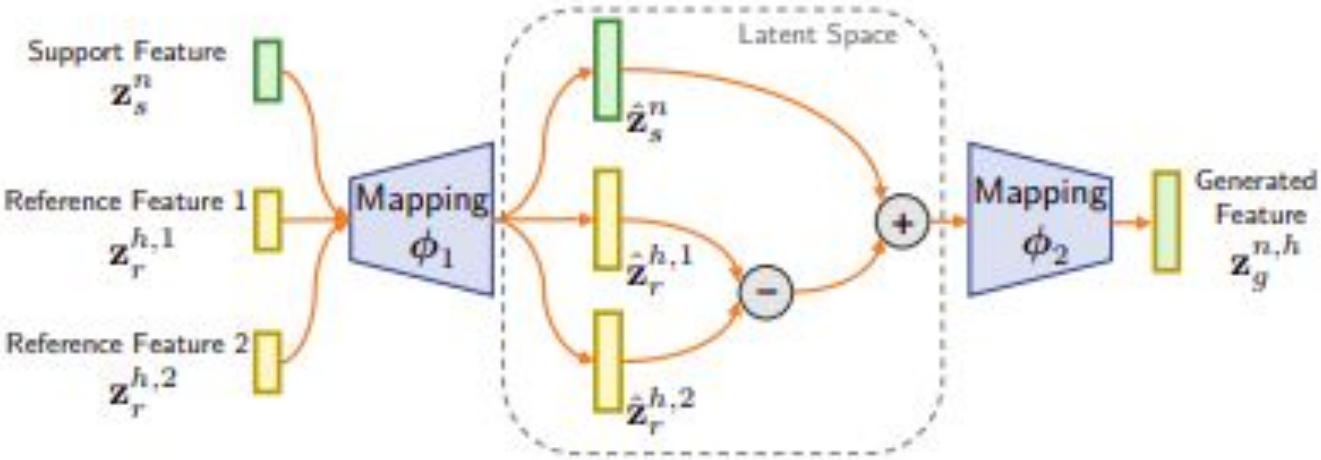


Feature Generation - via Diversity Transfer

- Two dataloaders
  - One for sampling support & query samples
  - Another for sampling referenced image pairs of same classes
- Feaure Extractor
  - Using backbone as sample code (ResNet10) to extract 512 dimension embeddings
- Feature Generator
  - Get diversity from image pairs of other class and add to the current support sample to generate extra feature
  - Blend generated features with original support features to get center of each class in classifier
- Classifier
  - Calculate cosine similarity of each query sample with class centers
  - Fix with a trainable coefficient

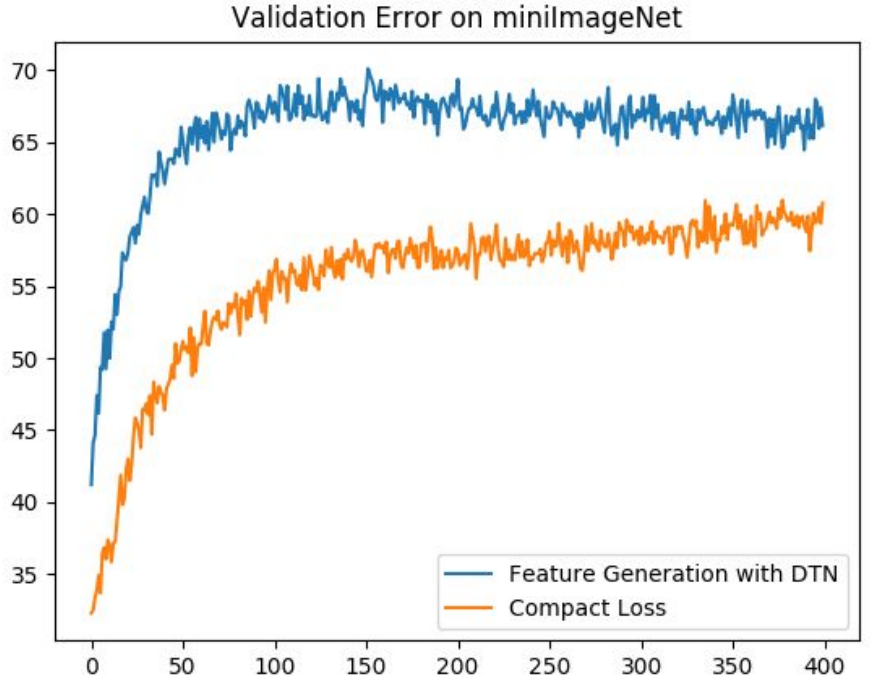
Feature Generator

- Three Input features are mapped into latent space
- Diversity (offset) is calculated in latent space and added to original support feature
  - To some degree, like data augmentation
- Mapping back to the same size as input, the result is supposed to a sample belonging to the same category as input support feature



Validation Error Observation

- Fast converge
  - Test Acc = 70.12% +- 0.91% on 151 epoch
- Some Overfitting issue on Feature Generation



Future Work

- Try different number of generated pairs and compare the result
- Try Auxiliary Task Co-training

Q&A