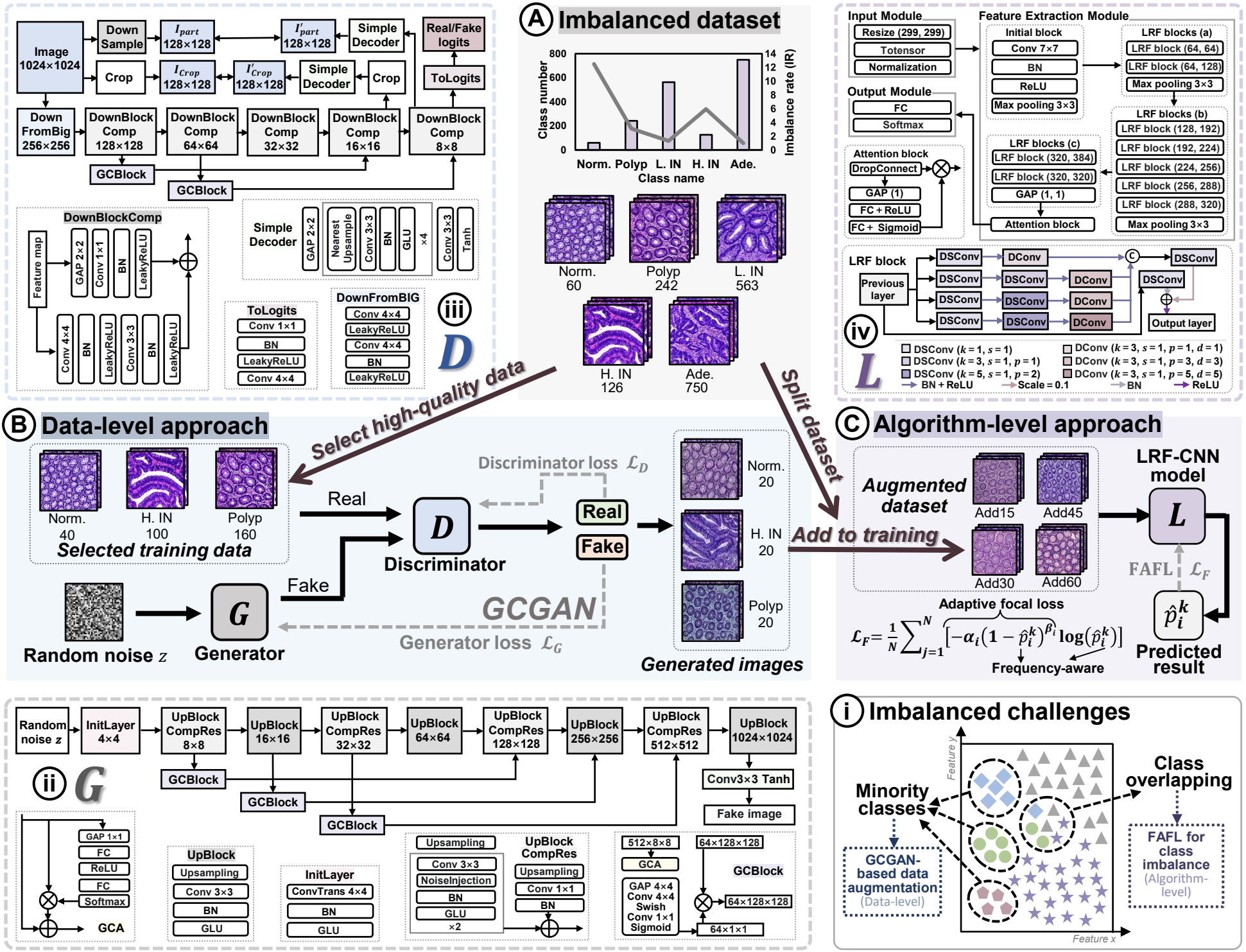

D Experiments

Primary (colorectal cancer)

Data-level approach

★ **Generation**

- Comparison: DDPM, FastGAN
- Ablation: UpBlockCompRes, GCBlock

★ **Classification**

- Comparison: Add different numbers of generated images

Algorithm-level approach

★ **Classification**

- Comparison: CE + SoftF1/SoftMCC, OHEM, class-balanced, and FL
- Ablation: Frequency-aware and AFL
- Hyperparameter sensitivity analysis

Combining two approaches

★ **Classification**

- 30 GCGAN-generated images + FAFL
- Comparison: WaveMix, CoAtNet-1, CONCH, ROAM, and CHIEF

Validation (four datasets)

★ **Generation**

- Using GCGAN to generate images

★ **Classification**

- 30 GCGAN-generated images + FAFL

E Result analysis

Performance metrics

- Generation: FID and IS
- Classification: Acc, P, R, F1, G-mean, and MCC; training time (per 100 images) and test time (per image)

Visualization

- 3D t-SNE method
- Confusion matrix
- Class distance matrix
- Grad-CAM visualization