Classificazione di immagini utilizzando tecniche di transfer learning sul dataset Fruit-360

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Dataset

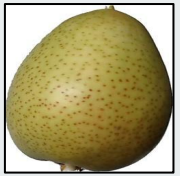
Fruit 360 | Un dataset di immagini contenente frutti e vegetali
Version: 2020.05.18.0

Numero di classi: 131
Dimensioni immagini: 100 x 100
Struttura immagini: Frutto segmentato su sfondo bianco
Più sottocategorie per frutto: [e.g. *“Apple red”*, *“Apple Golden”* ...]

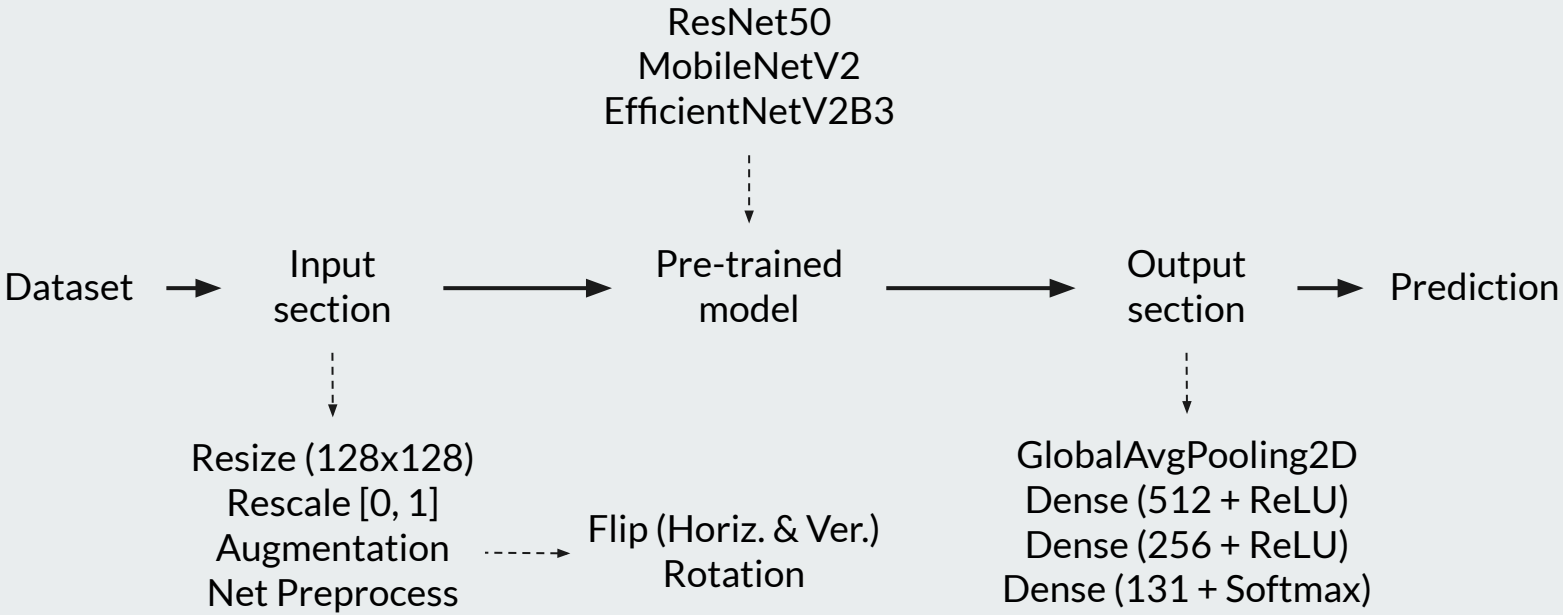
Partizione di train: 67692 immagini
Partizione di test: 22688 immagini
Partizione frutti multipli: 131 immagini


Apple Red

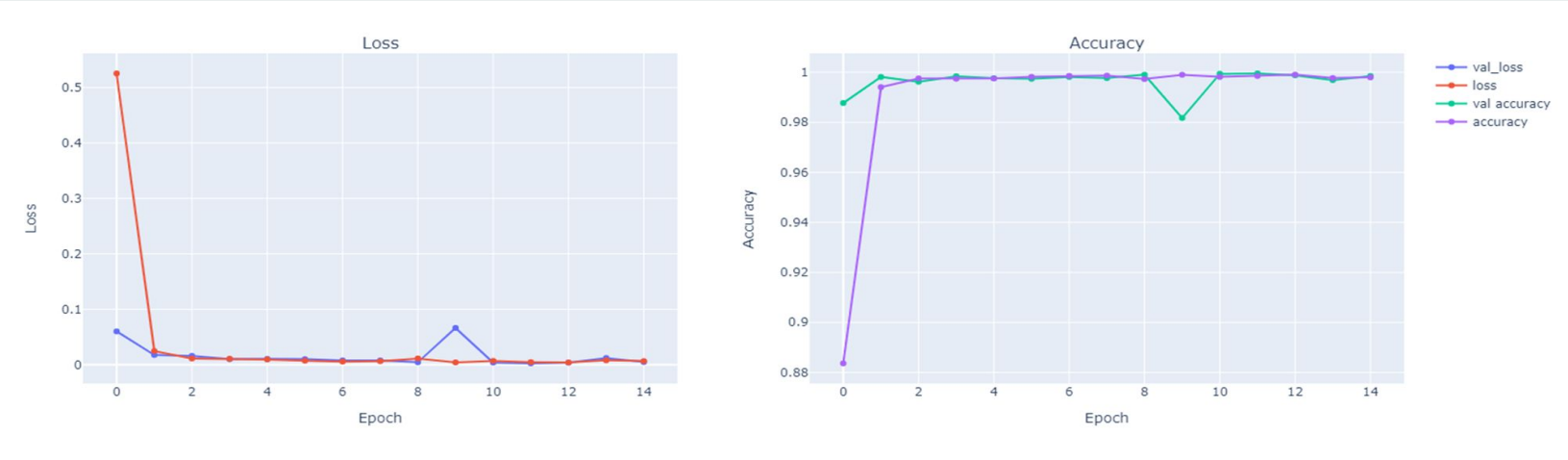

Avocado


Pear

Approccio metodologico - *Single label*

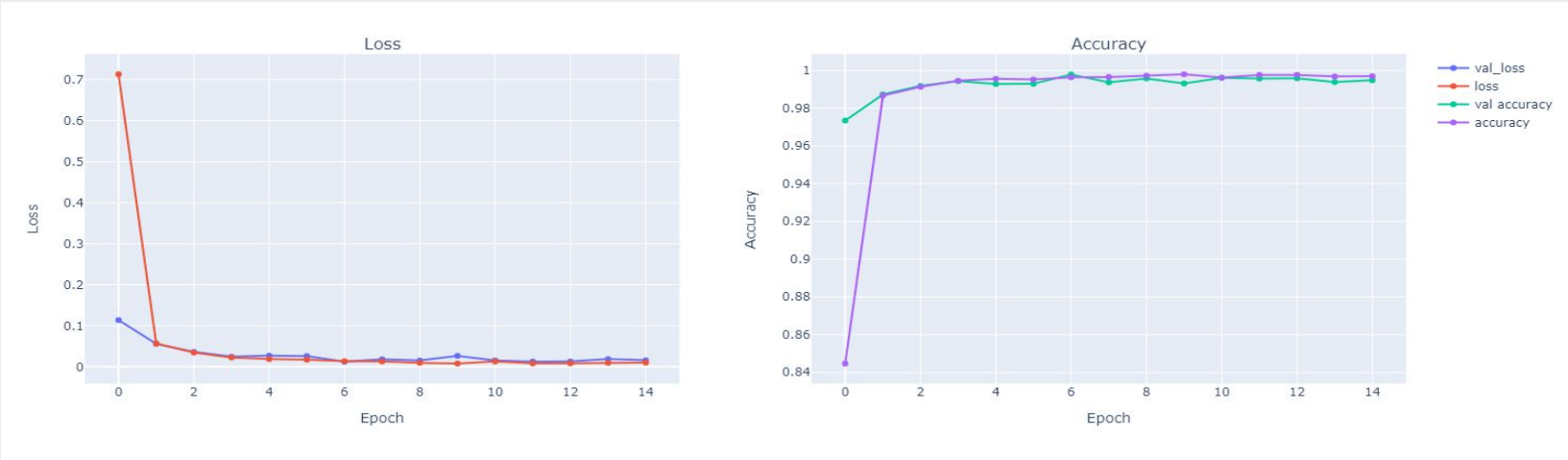


Risultati ottenuti - *Single label - ResNet50*



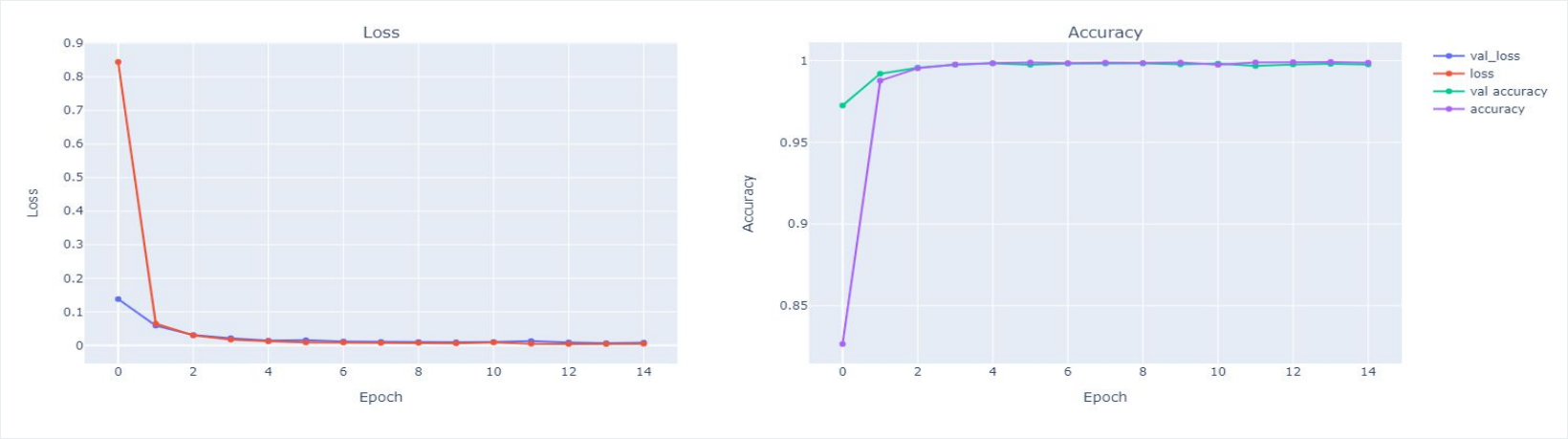
	Loss	Accuracy	Precision	Recall	F1-score
Train set	0.067	99.8%			
Validation set	0.044	99.8%			
Test set	0.085	97.9%	98%	98%	98%

Risultati ottenuti - *Single label - MobileNetV2*



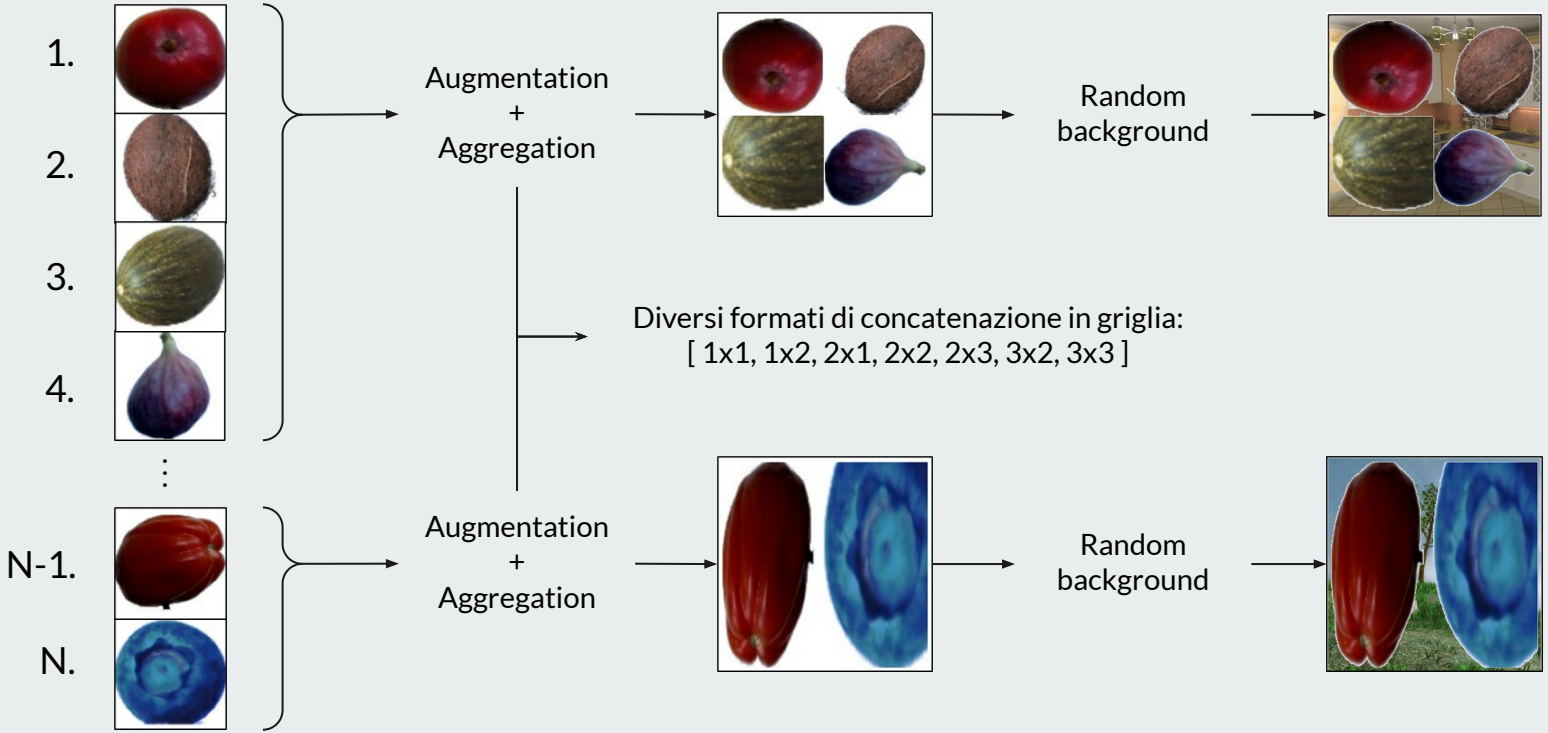
	Loss	Accuracy	Precision	Recall	F1-score
Train set	0.102	99.7%			
Validation set	0.157	99.4%			
Test set	0.126	96.8%	97%	97%	97%

Risultati ottenuti - *Single label - EfficientNetV2B3*

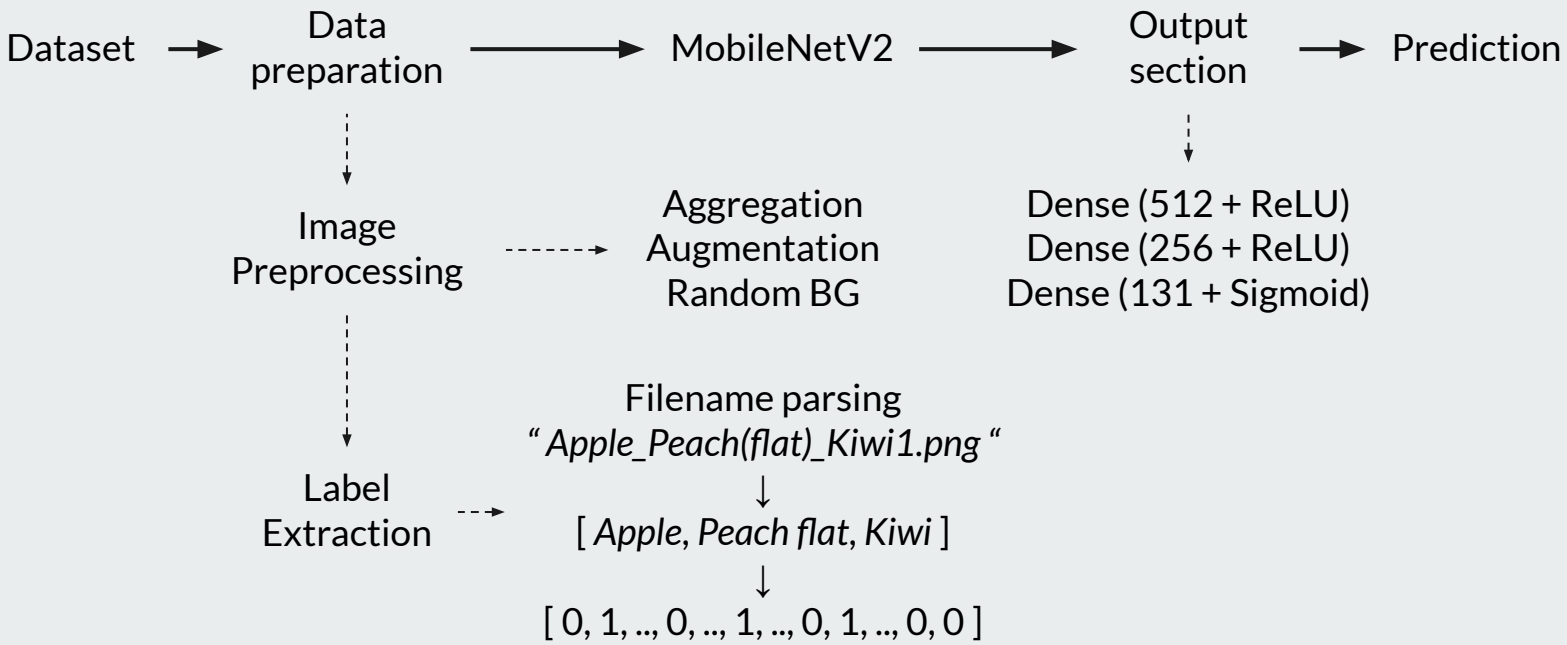


	Loss	Accuracy	Precision	Recall	F1-score
Train set	0.049	99.8%			
Validation set	0.083	99.7%			
Test set	0.120	97.4%	98%	97%	97%

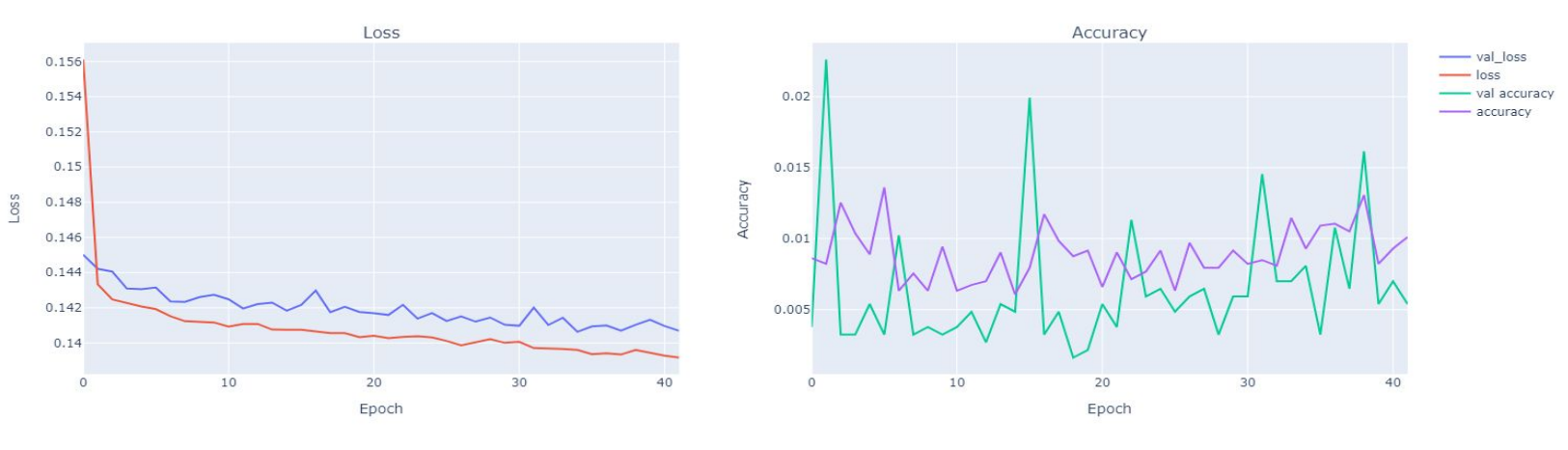
Approccio metodologico - *Multi-label image preprocessing*



Approccio metodologico - *Multi-label network*

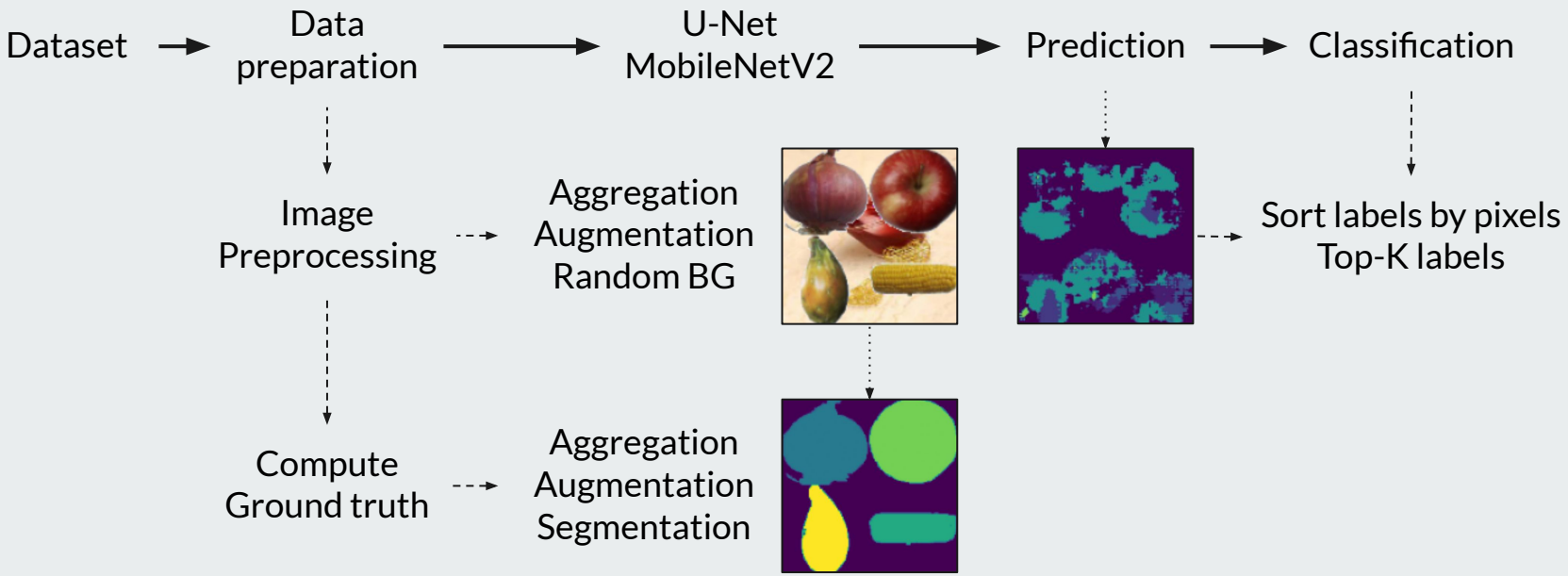


Risultati ottenuti - *Multi-label - MobileNetV2*

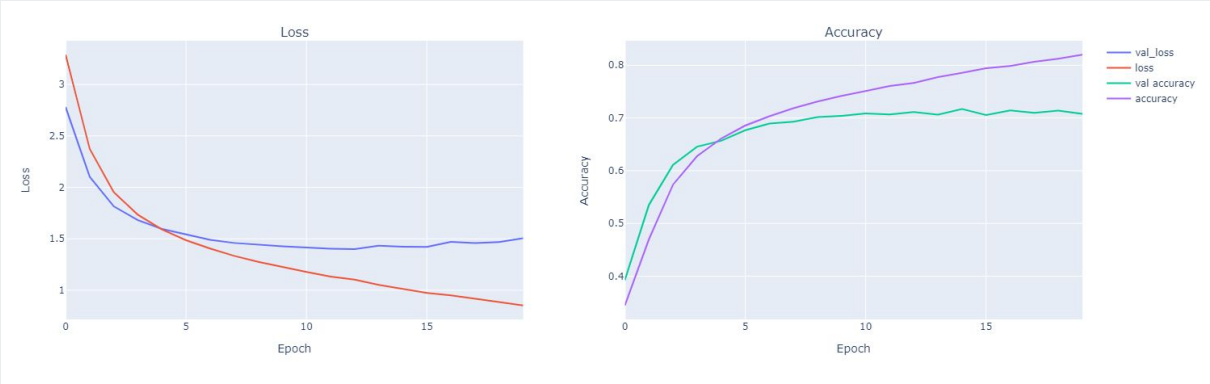


	Loss	Accuracy	Precision	Recall	F1-score
Train set	0.139	1.01%			
Validation set	0.141	0.54%			
Test set	0.0	0%	0%	0%	0%

Approccio metodologico - *Segmentazione + classificazione*



Risultati ottenuti - *Multi-label - Segmentation + Classification*



	Loss	Accuracy	Precision	Recall	F1-Score
Train set	0.85	82%			
Validation set	1.50	71%			
Test set			17.9%	22.1%	15.8%

Conclusioni e miglioramenti futuri

Classificazione single label → Improvements

- Approccio transfer learning si rivela efficace
- Necessario test anche su immagini reali
- Leggere criticità su specifiche classi

- Ensemble modelling

Classificazione multi-fruit → Improvements

- Composizione immagini necessaria
- Approccio multi-label non efficace
- Approccio U-Net è buona base di partenza

- Utilizzo dataset reale per training
- Complessità U-Net
- Morfologia matematica per refining della segmentazione