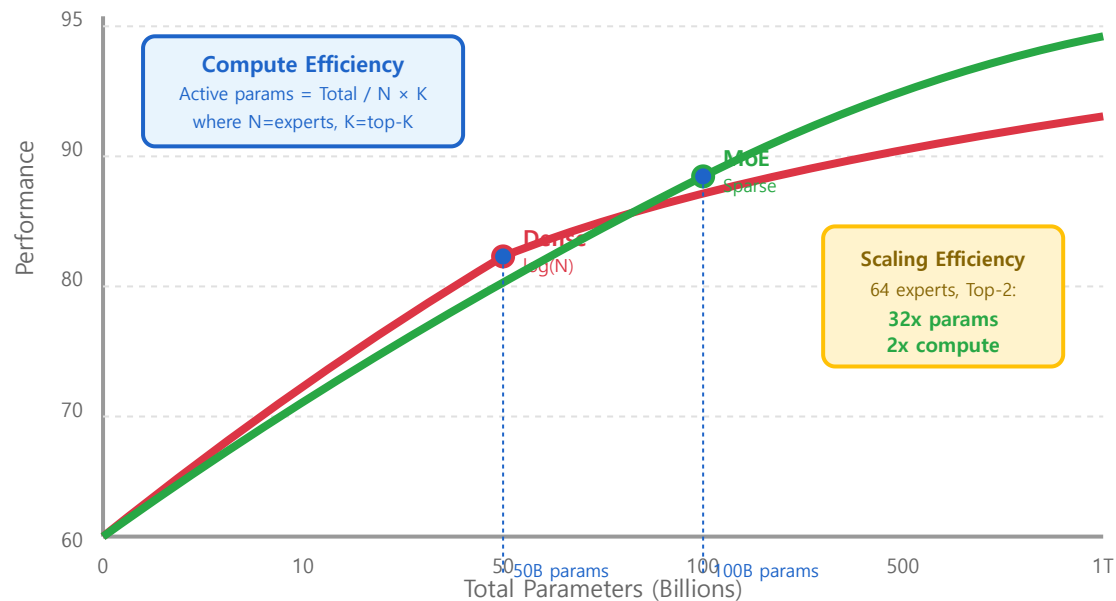


# Scaling Laws for Mixture of Experts

## Performance vs Model Size: MoE Scaling Advantage



### Parameter Scaling

- Performance  $\propto \log(\text{Parameters})$
- Sub-linear gains beyond size
- Efficient with sparse activation

### Compute Scaling

- Active = Total / N × K
- 64 experts, Top-2:  
**32x params, 2x compute!**

### Data Requirements

- More params need diverse data
- Medical: 10-100M samples
- Multi-modal beneficial

### Inference Cost

- Latency: active experts only
- Memory: all weights loaded
- Bandwidth: critical factor

### Scaling Predictions

MoE models can scale to trillions of parameters while maintaining practical inference costs. **Medical MoE with 128 experts and 10B params performs like 200B dense model** with fraction of the compute.