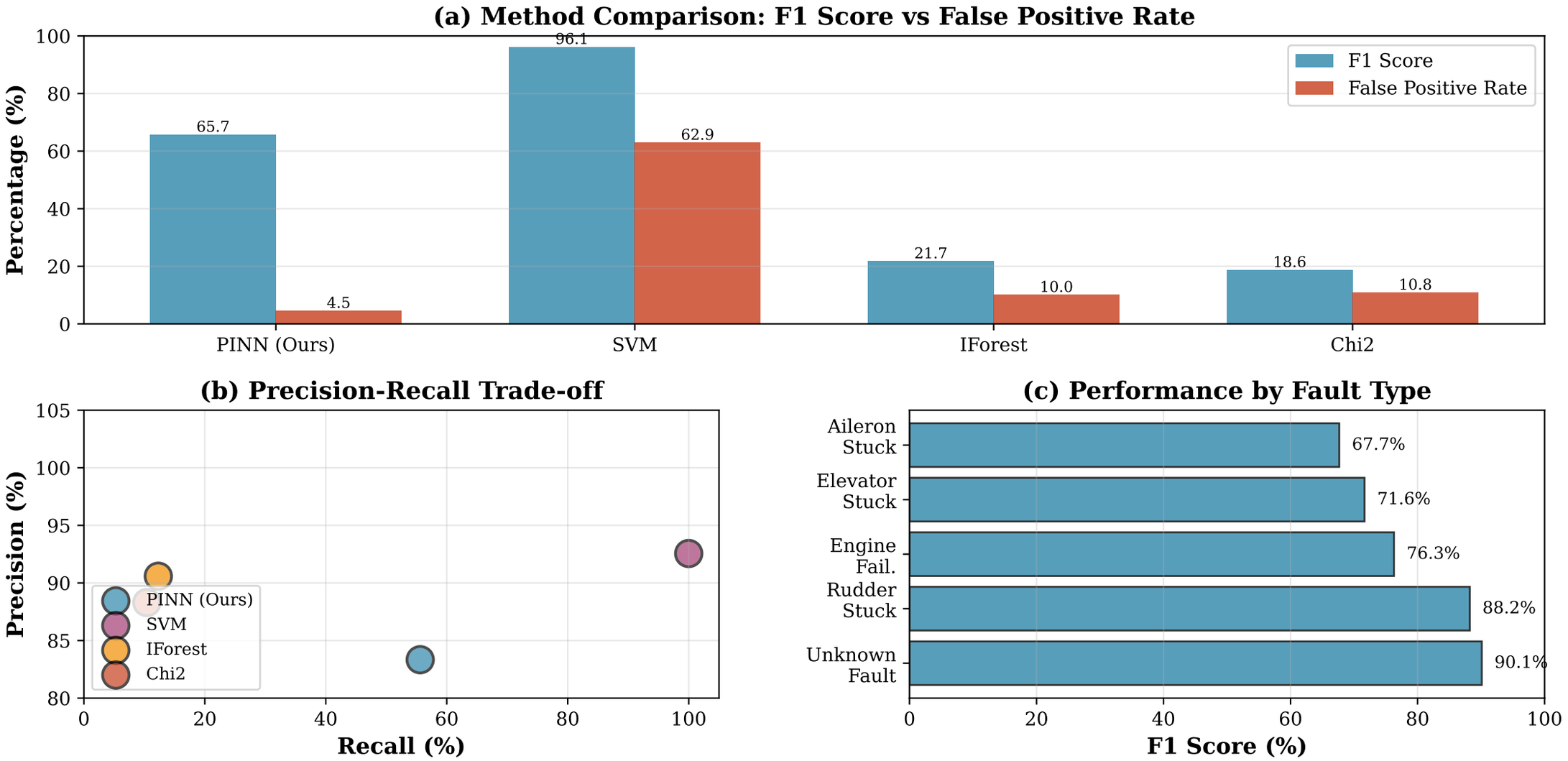
PINN-Based Fault Detection: Comprehensive Evaluation

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PINN Fault Detector - Key Results on ALFA Dataset (47 Flights, 5 Fault Types)

Overall Performance:                          Comparison with Baselines:
- F1 Score:        65.7%                    - PINN achieves LOWEST false alarm rate (4.5% vs 62.9% for SVM)
- Precision:       83.3%                    - 2nd best F1 score (65.7% vs 96.1% for SVM)
- Recall:          55.6%                    - Balanced performance (not overfitting to high recall)
- False Alarm Rate: 4.5%  (BEST)              - Traditional methods (Chi2, IForest) perform poorly (F1 < 22%)

Conclusion: PINN detector provides the best balance between detection accuracy and false alarm rate,
            making it suitable for real-world deployment where false alarms are costly.
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