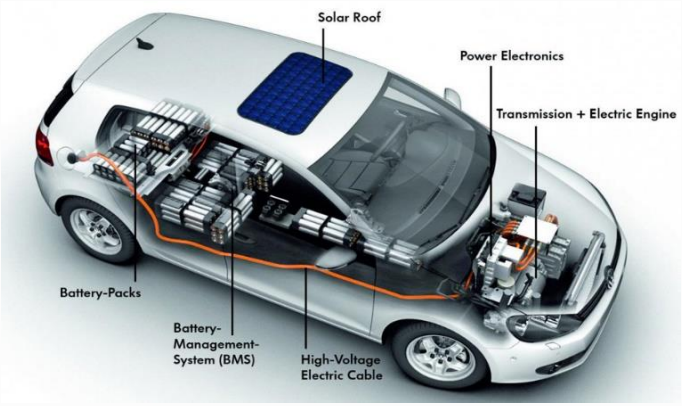
ESTIMASI *OCV-SOC* PADA BATERAI *LITHIUM POLYMER* MENGGUNAKAN METODE *BACKPROPAGATION NEURAL NETWORK*

Ungu Primadusi

Mobil Listrik, transportasi *eco-friendly*



Battery Management System

SOC sebagai *state variabel* pada BMS

Estimasi SOC Baterai

BPNN, metode *Artificial Intelligence*

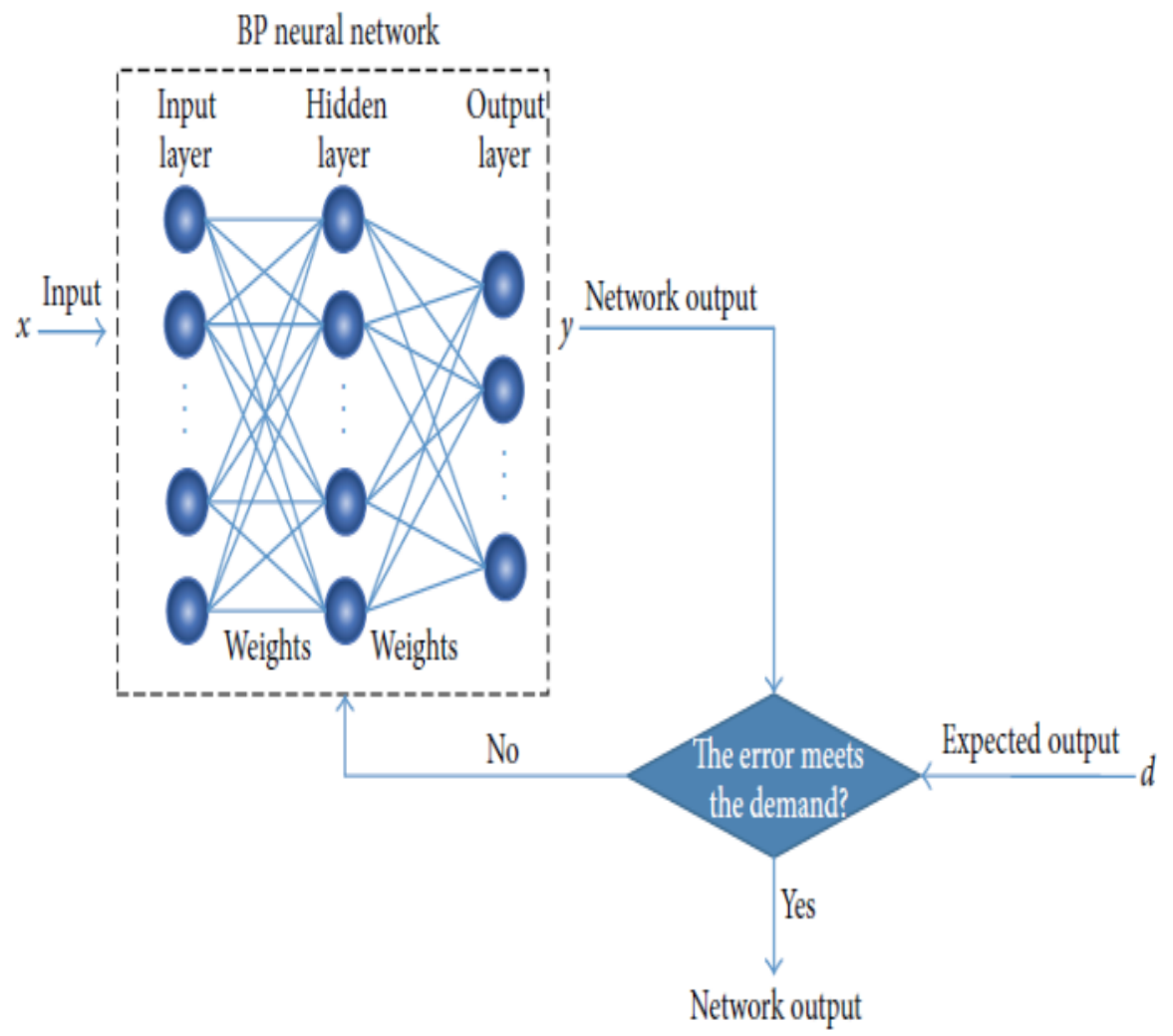
Implementasi

Mencegah:
Overcharge
Overdischarge

Key Paper

Paper 1	Ng KS, Moo CS, Chen YP, Hsieh YC, "**Enhanced coulomb counting method for estimating state-of-charge and state-of-health of lithium-ion batteries**,", 2009.
Paper 2	L. Qian, Y. Si, and L. Qiu, "**SOC estimation of $LiFePO_4$ Li-ion battery using BP Neural Network**," 2015.
Paper 3	W. Jian, X. Jiang, and J. Zhang, "**Comparison of SOC Estimation Performance with Different Training Functions Using Neural Network**," 2012.
Paper 4	G. Wang, "**Estimation of Power Battery SOC Based on Improved BP Neural Network**," 2014.
Paper 5	Y. Zhou, "**Application of Genetic Neural Network in Power Battery Charging State-of-Charge Estimation**," 2011.

BPNN

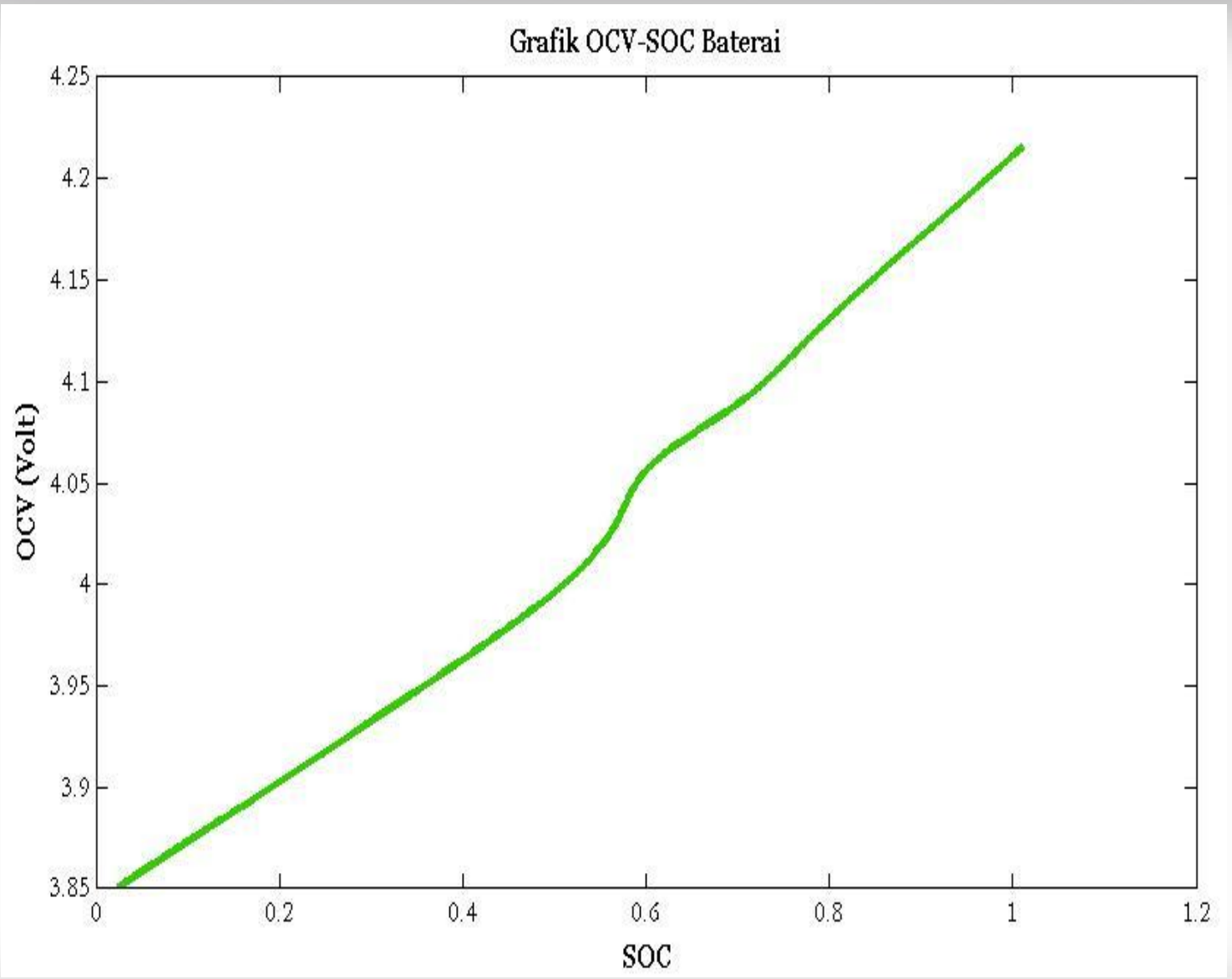


Metode BPNN:

1. Arsitektur terdiri Input Layer, Hidden Layer, Output Layer
2. Algoritme terdiri tiga fase:
   - Propagasi Maju (*Feedforward*)
   - Propagasi Mundur (*Backpropagation*)
   - Perubahan Bobot (*Numerical Weight*)
3. Fungsi Aktivasi:

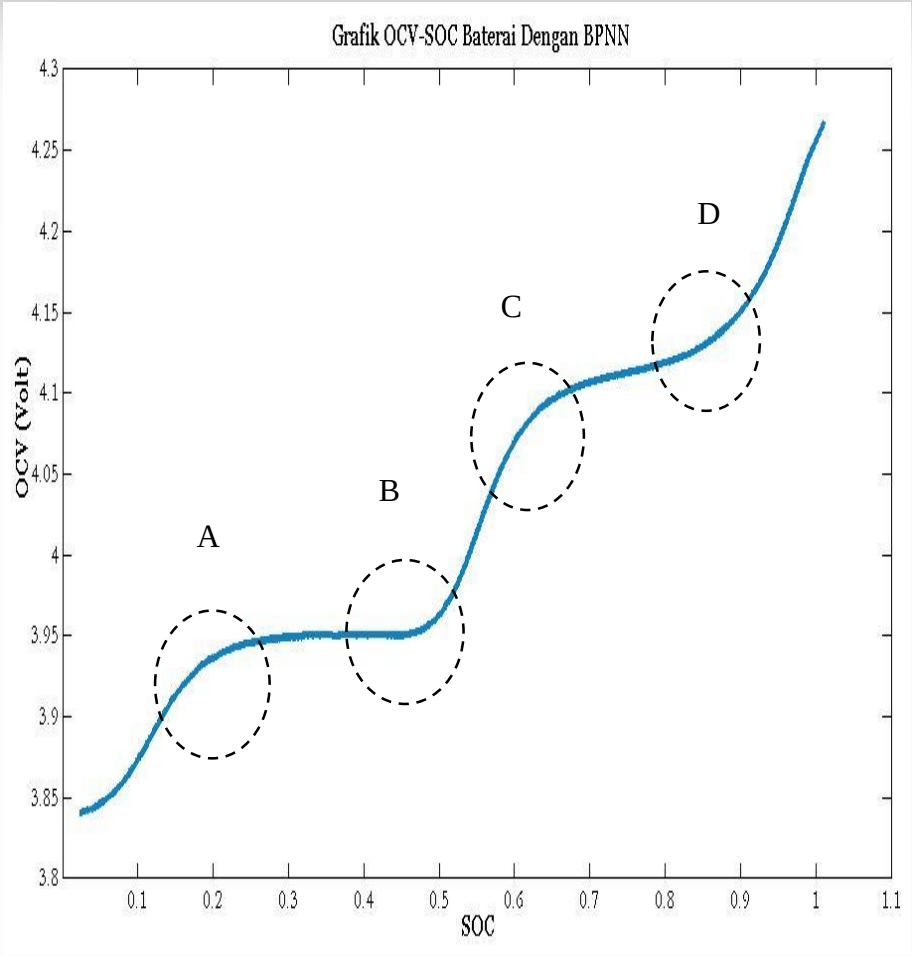
   Hiperbolic Tangent dan

   Linier.

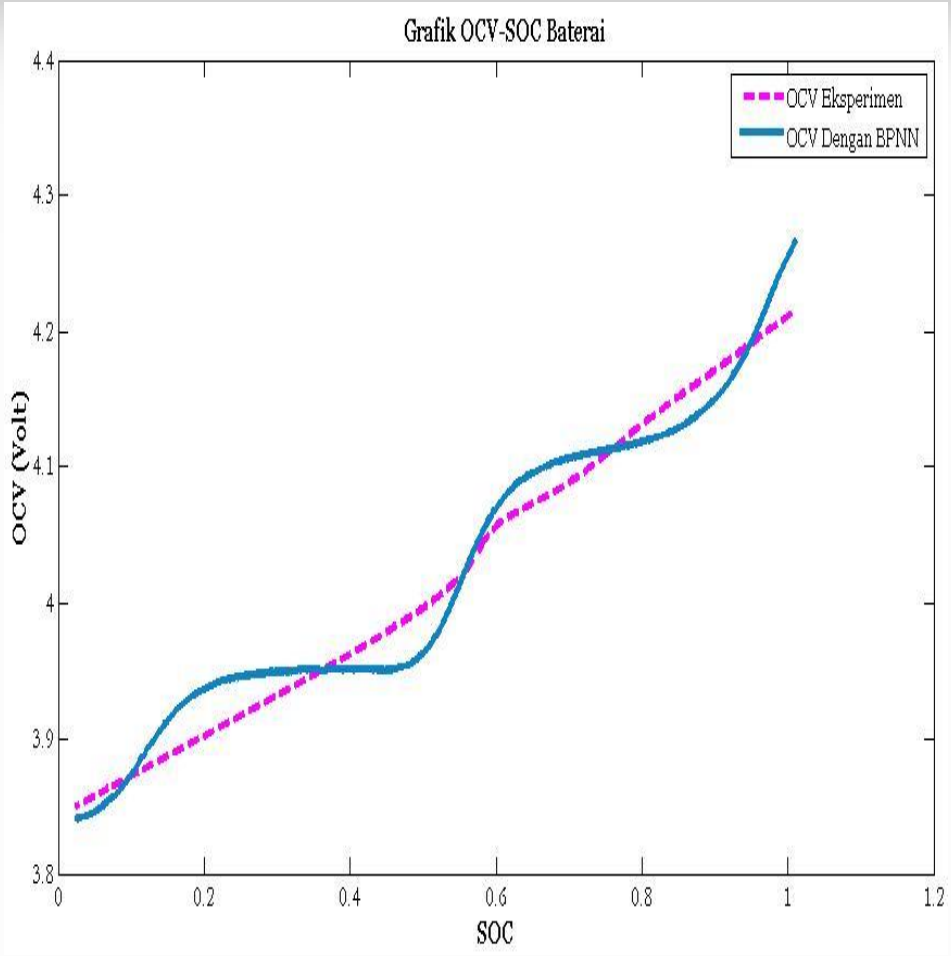


- OCV: 3,85 V- 4,21 V
- SOC: 2,34 % - 100%

Hubungan OCV-SOC Baterai *Lithium Polymer*



Dengan BPNN



Eksperimen dan BPNN

Slope A: 20% (3,92 V)
Slope B: 50 % (3,95 V)
Slope C: 60% (4,1 V)
Slope D : 90 % (4,15 V)

MSE: 0,00035182
RMSE : 0,0187
Galat *(Error):* 3 %

Eksperimen OCV-SOC	
Parameter	**Nilai**
Hidden Layer	2 *layer*
Hidden Neuron	3 *neuron* dan 4 *neuron*
OCV	3,84 Volt - 4,27 Volt
SOC	2,34 % - 100 %
Galat (error)	3 %
MSE	0,00035182 (Hasil Komputasi) 0,000357 (Hasil Perhitungan)
RMSE	0,0187 (Hasil Komputasi) 0,0189 (Hasil Perhitungan)
MAPE	0,408 %
R	0,9944

Terima Kasih