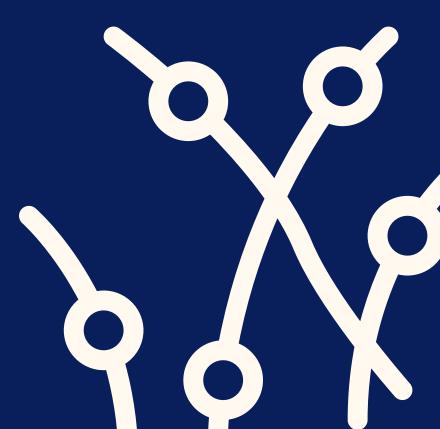


RBL: MACHINE LEARNING AND AI

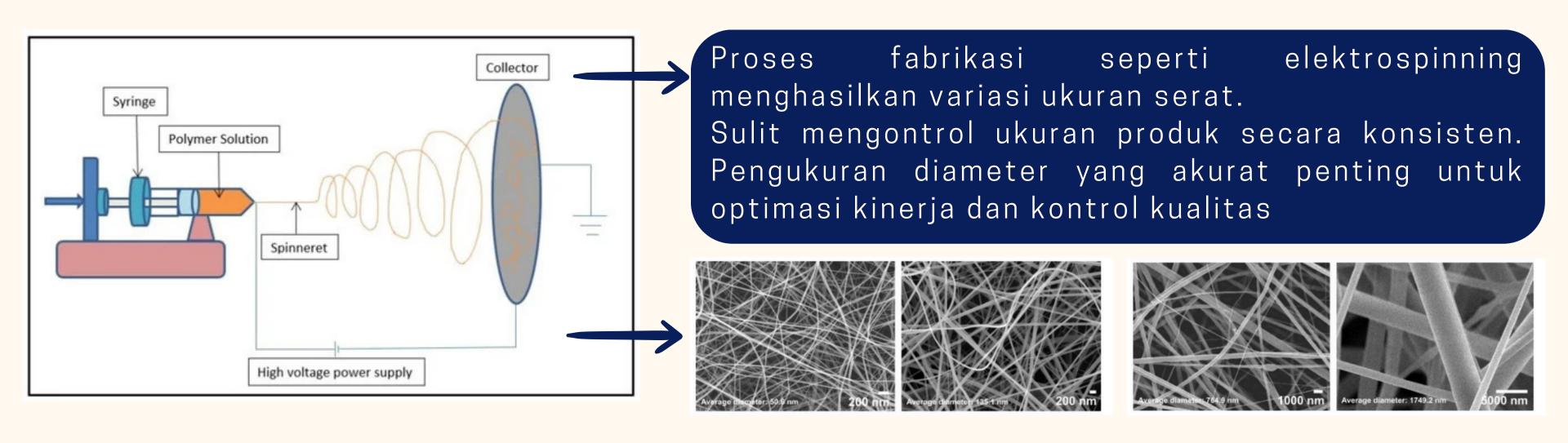
PREDICTING NANOFIBER AVERAGE DIAMETER USING MACHINE LEARNING

TIM:

DIKI FERNANDI - 20124023
AULIA DEFITRI WULANDARI - 20224001
KAMILAH NADA MAISA - 20224010
SUDARMINTO SENLAU - 20224007

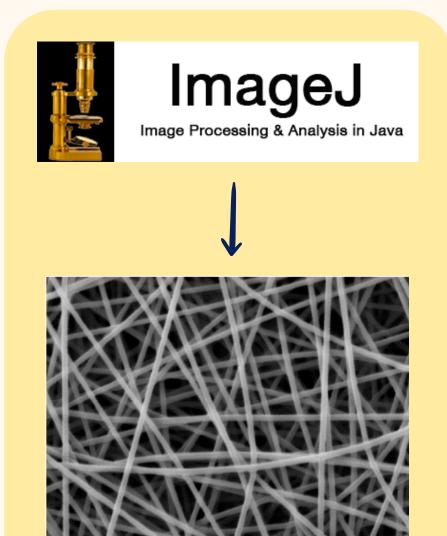


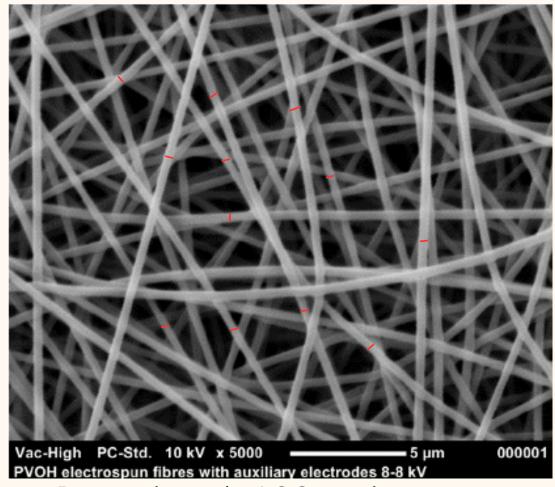
NANOFIBER MEMILIKI APLIKASI LUAS: FILTRASI, PENYIMPANAN ENERGI, REKAYASA BIOMEDIS, DAN SENSOR.





METODE KONVENSIONAL





- Penarikan \geq 100 titik
- Butuh banyak waktu (Pham et al., 2006)

	OTIL TOO	Juito						Mean9 Mean10 Mean11 235 232 230 236 235 233 207 219 214		
an1	Mean2	Mean3	Mean4	Mean5	Mean6	Mean7	Mean8	Mean9	Mean10	Mean11
	233	246	234	244	244	238	235	235	232	230
	232	243	234	242	242	239	236	236	235	233
l	218	179	211	183	178	192	203	207	219	214

Otomatis mendapat average diameter



TUJUAN:

Membangun model machine learning yang mampu memprediksi nilai rata-rata diameter nanofiber berdasarkan informasi visual dari citra Scanning Electron Microscopy (SEM).





METODE:

SEM image collection

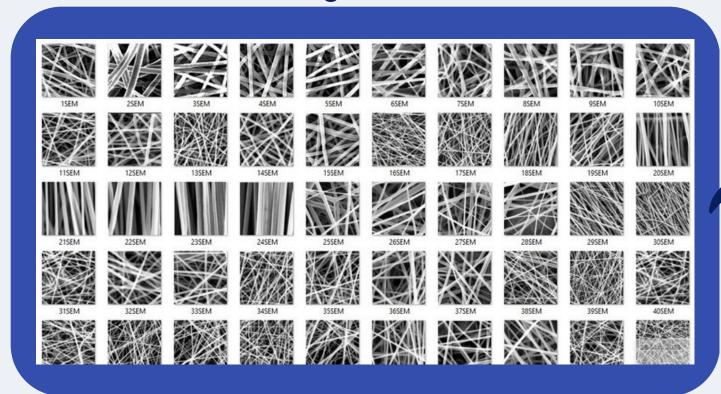
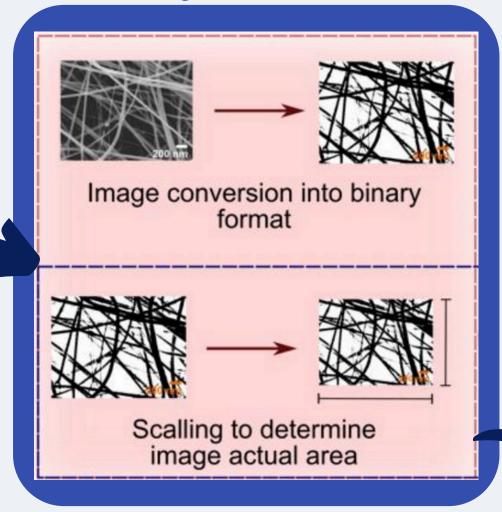


Image adjustment using ImageJ software





Performance Evaluation:

RMSE, MAE. MAPE, Time, and R² Applying Various
Machine Learning
Models:

Linear Regression, Random Forest, and Gradient Boosting



Using PCA to reduce features

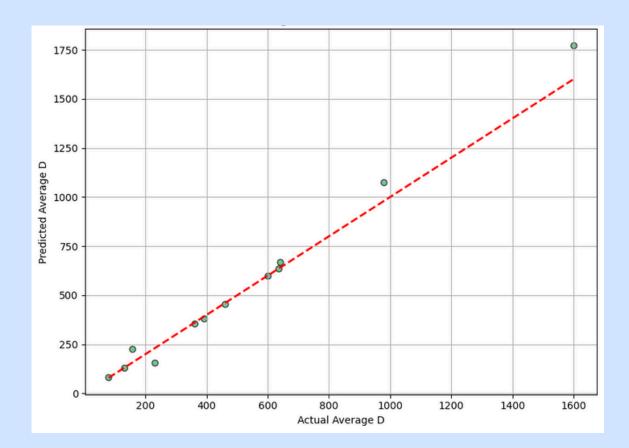
Column305 v	Column306 -	Column307 v	Column308 -	Column309 -	Column310 -	Column311 v	Column312 v	Column313 v	Column314 v	Column315 v	Column316 -	Column317 -	Column318 -	Cole
n299	n300	n301	n302	n303	n304	n305	n306	n307	n308	n309	n310	n311	n312	n31
continuous	con													
hidden=True	hide													
0.610834	0.0998487	0.863847	0.734375	1.37406	0.051706	0.0508114	0.435357	0.0768322	0.34474	0.190087	3.43692	0.020226	0.282111	0.03
0.44641	0.262624	0.333215	0.707796	1.387	0.291115	0.00483698	0.492168	0.170218	0.465566	0.269647	2.09289	0.00249888	0.0434898	0.02
0.342013	0.452026	0.234796	0.440185	0.767393	0.0733621	0.0570925	0.452167	0.169269	0.369357	0.0897769	2.18621	0.0110247	0.182637	0.03
0.976123	0.0954647	0.37003	0.191671	1.97251	0.368564	0.0077006	0.304934	0.0302728	0.688167	0.00901818	2.123	0	0.135494	0.03
0.456526	0.366199	0.0842741	0.109254	1.06474	0.153478	0.0301277	0.140297	0.611073	0.362439	0	2.27515	0	0.1079	0.00
0.0686845	0.126815	0.450764	0.328755	0.502755	0.0411726	0.288262	0.275574	0.323762	0.477205	0.0362683	1.34444	0.0491642	0.649861	0.04
0.254578	0.0885341	0.414976	0.352936	2.49782	0.262487	0.0698105	0.278182	0.00106672	0.617664	0.0256694	2.1717	0.0170554	0.363981	0.02
0.3163	0.0273096	0.202141	0.643733	1.43755	0.187912	0.00517279	0.5216	0.0277864	0.390224	0	1.3626	0	0.27	
0.71599	0.883626	0.404261	0.609101	1.38088	0.0366889	0.0645141	0.216338	0.0365817	0.148983	0.00563813	2.23108	0.011309	0.2100.	0.12
1.40464	0.545154	0.506212	0.391368	1.95907	0.128442	0.00563826	0.178826	0.163313	0.477983	0.00912251	2.50377	0.0257442	0.0857444	0.14
0.550937	0.35124	0.52359	0.674519	0.975141	0.115835	0.159984	0.53166	0.120411	0.269459	0.025866	2.73935	0.00268691	0.356402	0.16
0.159875	0.162282	0.0400647	0.0788322	0.548385	0.0151304	0.283376	0.2526	0.660375	0.0976265	0.00854159	3.49203	0.00638128	0.0164556	0.46
0.0230473	0.0324493	0	0.0395385	1.13644	0.104684	0.140655	0.576641	1.12753	0.0837607	0	2.90468	0.00619629	0.377871	0.05
0	0.0276973	0.0141944	0.15186	0.871421	0.30953	0.0382486	0.194358	1.72084	0.0645772	0.00391169	2.34525	0.00923857	0.308263	0.14
0.0699305	0.0396057	0.0396277	0.179714	0.780097	0.0718813	0.0377939	0.0287462	0.517021	0.0158867	0.108022	1.22979	0.15985	0.240992	0.07
0.00732791	0.296361	0.0340757	0.252009	0.458135	0.100604	0.0119424	0.0936545	0.707857	0.00457824	0.255268	0.816701	0.231218	0.10206	0.00
0.0802996	0.511562	0.472112	0.74698	0.478906	0.0527758	0.00682007	0.385778	0.0433266	0.291906	0.13891	1.32098	0.0513099	0.260424	0.00
0.283822	0.475563	0.669187	0.575385	0.239122	0.0588196	0	0.130474	0.129139	0.122794	0.269425	2.75747	0.0449352	0.377255	0.00



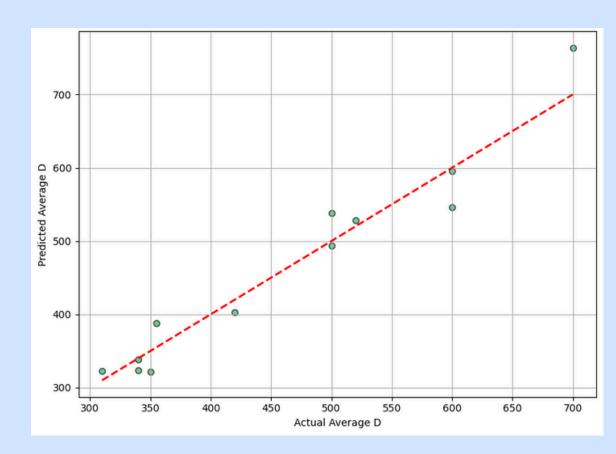
Features extraxtion using inception V3

HASIL

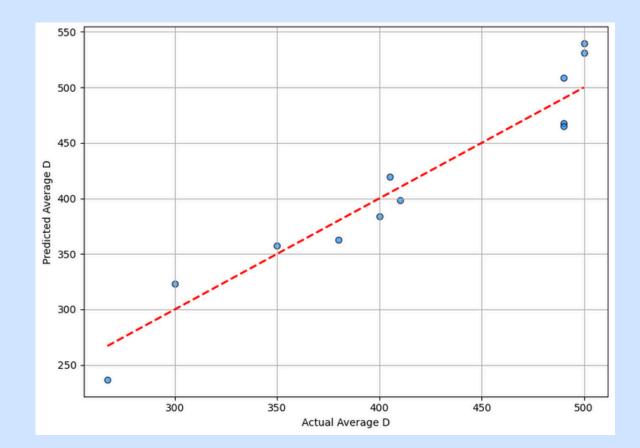
Linier Regression



XGBoost



Random Forest



RMSE: 23.07

R² Score: 0.98

MAE: 21.36

MAPE: 4.99%

Waktu:1s

RMSE: 30.37

R² Score: 0.94

MAE: 23.56

MAPE: 5.30%

Waktu: 34 s

RMSE: 45.09

R² Score: 0.91

MAE: 30.37

MAPE: 9.31%

Waktu: 60 s

- 1. Linier Regression memiliki hasil evaluasi terbaik.
- 2. Nilai korelasi antara fitur dan target secara rata-rata 0,72.
- 3. Model XGBoost & Random Forest tidak unggul berdasarkan waktu running.



KESIMPULAN

Berdasarkan hasil evaluasi, Linear Regression merupakan model terbaik untuk memprediksi diameter nanofiber, diikuti oleh XGBoost dan Random Forest. Urutan ini didasarkan pada metrik performa seperti R², RMSE, MAE, MAPE, dan Waktu.

SARAN

Mengingat hubungan linier yang sangat dominan pada data ini, penelitian selanjutnya dapat difokuskan pada pencarian atau pembuatan dataset dengan pola non-linier agar perbandingan antar model menjadi lebih signifikan dalam konteks kompleksitas prediksi.



TIMELINE

REFERENCES:

ITB | 2025





THANKS

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