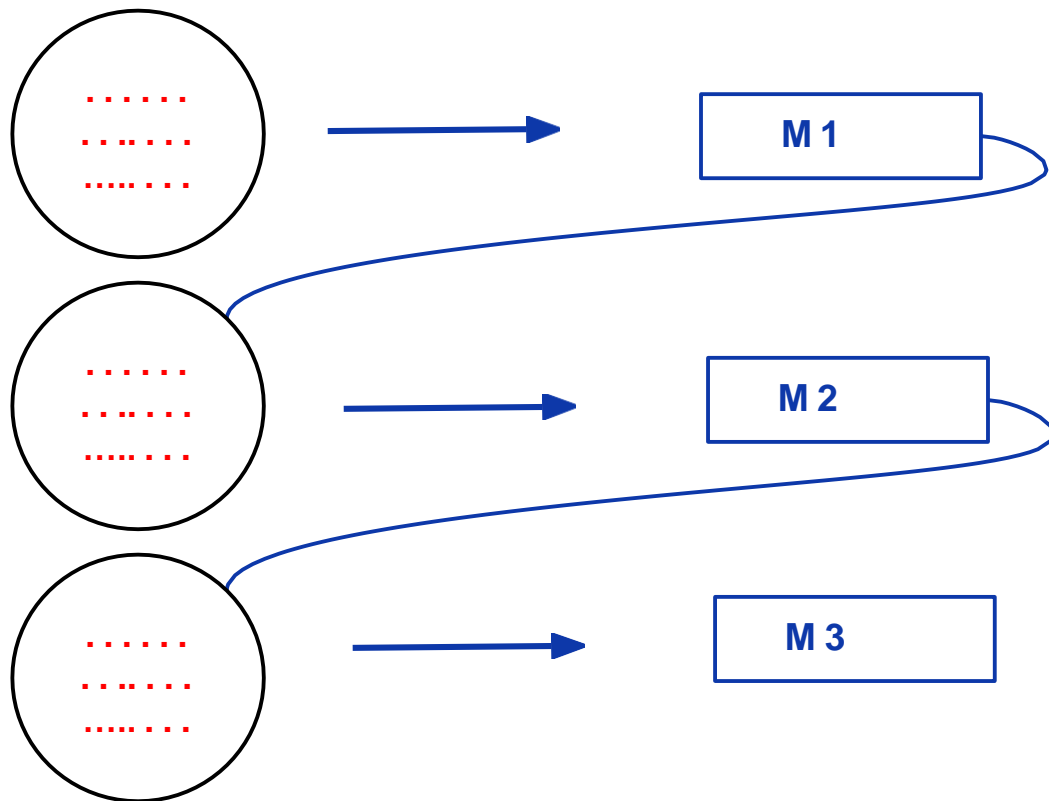


Boosting



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Boosting Methods

- **AdaBoosting** (Adaptive Boosting)
 - In AdaBoost, the successive learners are created with a focus on the ill fitted data of the previous learner
 - Each successive learner focuses more and more on the harder to fit data i.e. their residuals in the previous tree
- **Gradient Boosting** (GBM)
 - Each learner is fit on a modified version of original data. Original data is replaced with the x values and residuals from previous learner
 - By fitting new models to the residuals, the overall learner gradually improves in areas where residuals are initially high
- **XG Boost (Extreme Gradient Boosting)** (XG M)
 - Upgraded implementation of Gradient Boosting. Developed for high computational speed, scalability, and better performance.
 - Parallel Implementation, Cross-Validation, Cache Optimization, Distributed Computation

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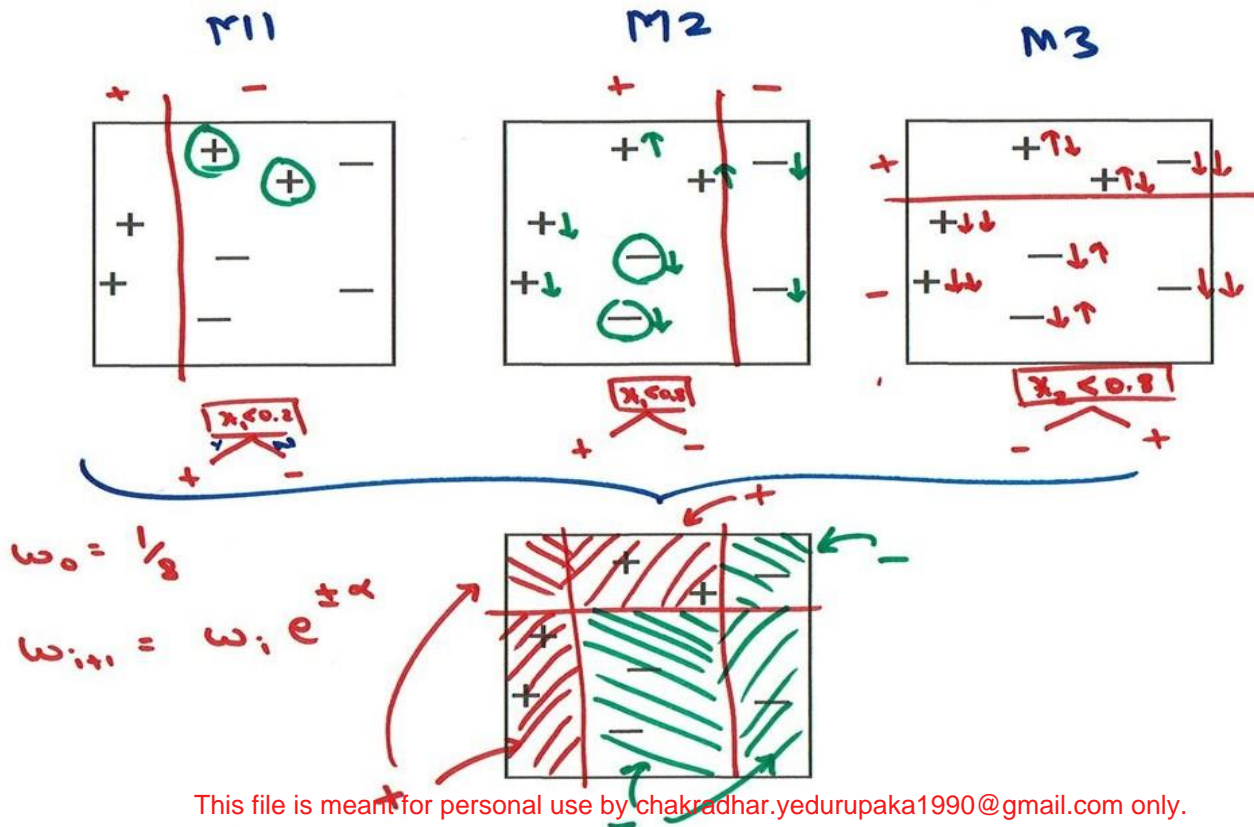
X1	X2	Y
...	...	+
..	...	+
..	...	-
..
..
..
..
..
..
..
..
..
..

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AdaBoost

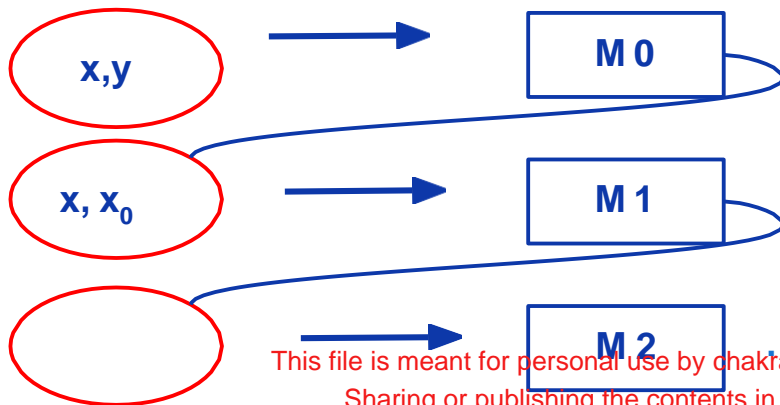


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Gradient Boosting

	x		y	y_0	$y - y_0$	h
			50	40	10	8
			92	100	-8	-8
			60	80	-20	-10
			64	50	14	12
		



$$y_0 = h_0(x)$$

$$y = h_0(x) + \alpha_1 h_1(x)$$

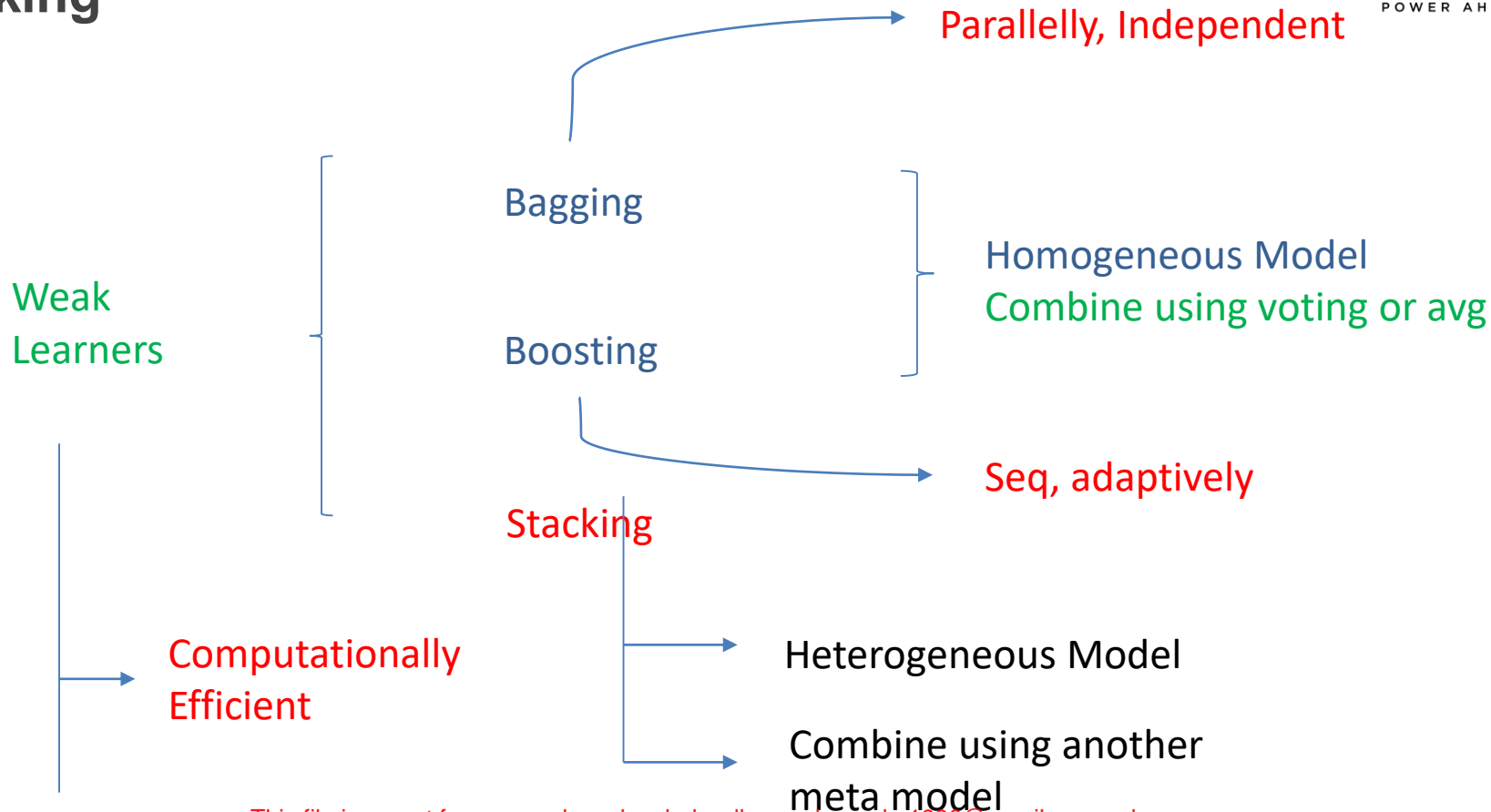
$$y = h_0(x) + \alpha_1 h_1(x) + \alpha_2 h_2(x) + \dots$$

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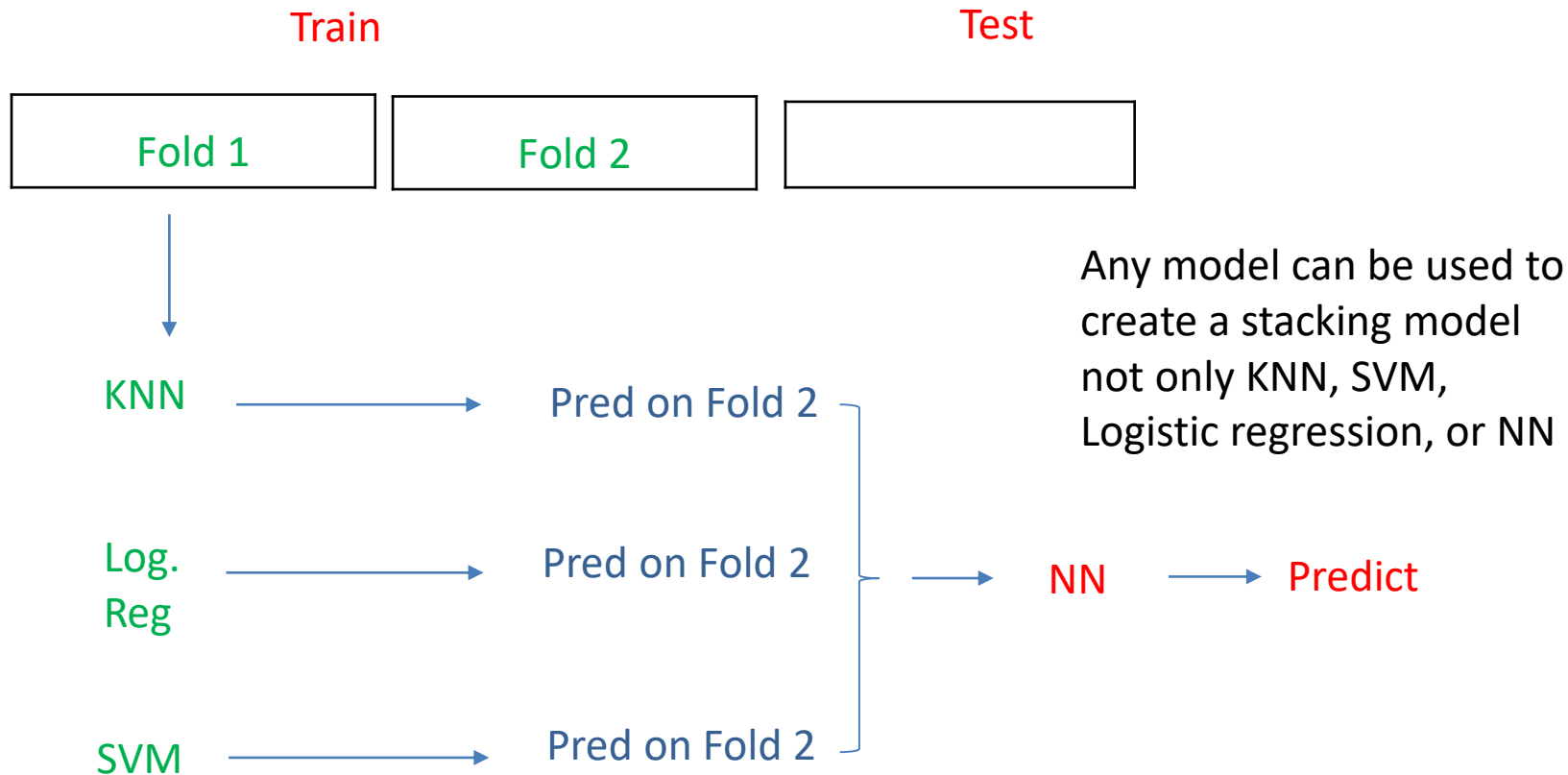
Stacking



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