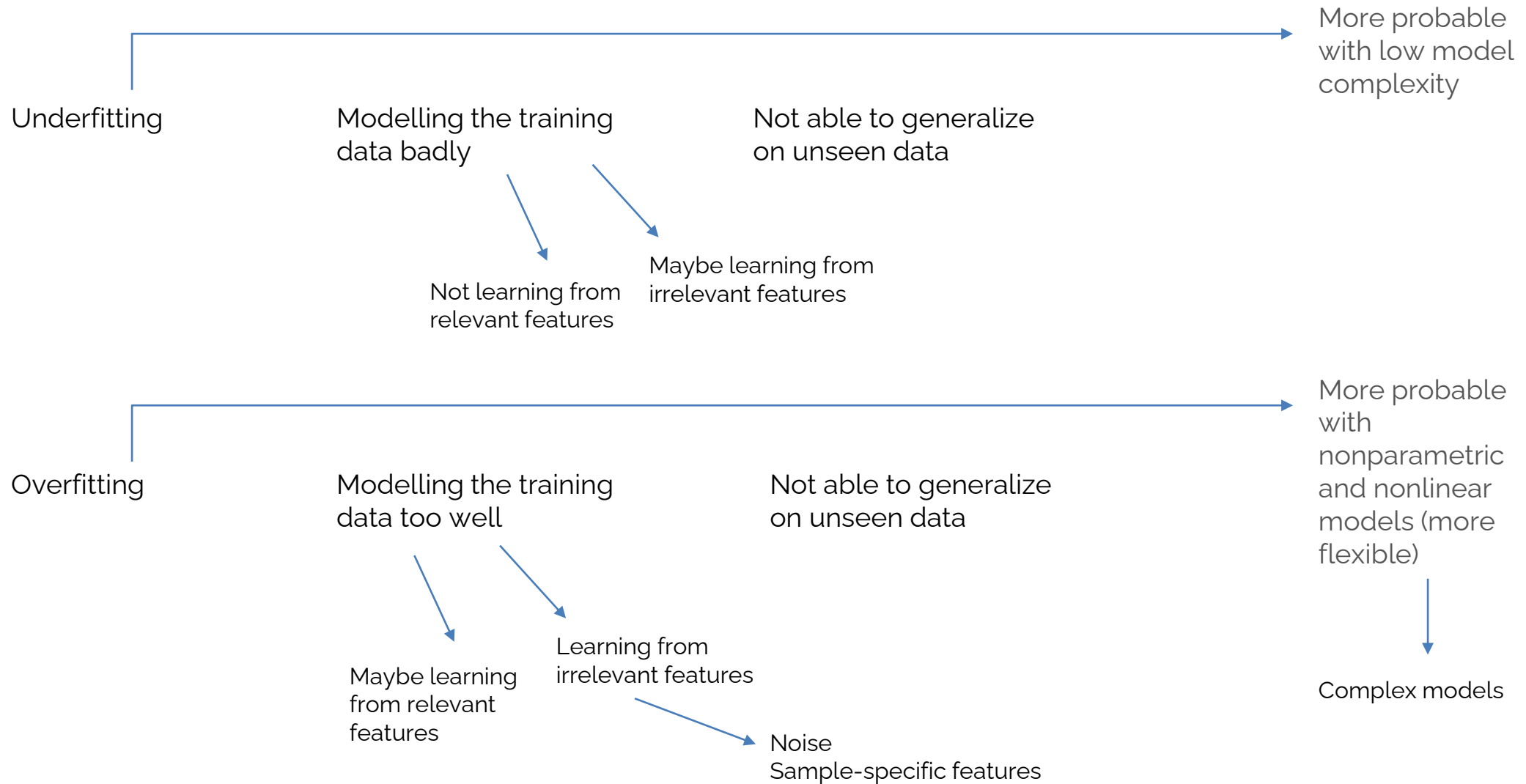


# Machine learning: basi e sue applicazioni

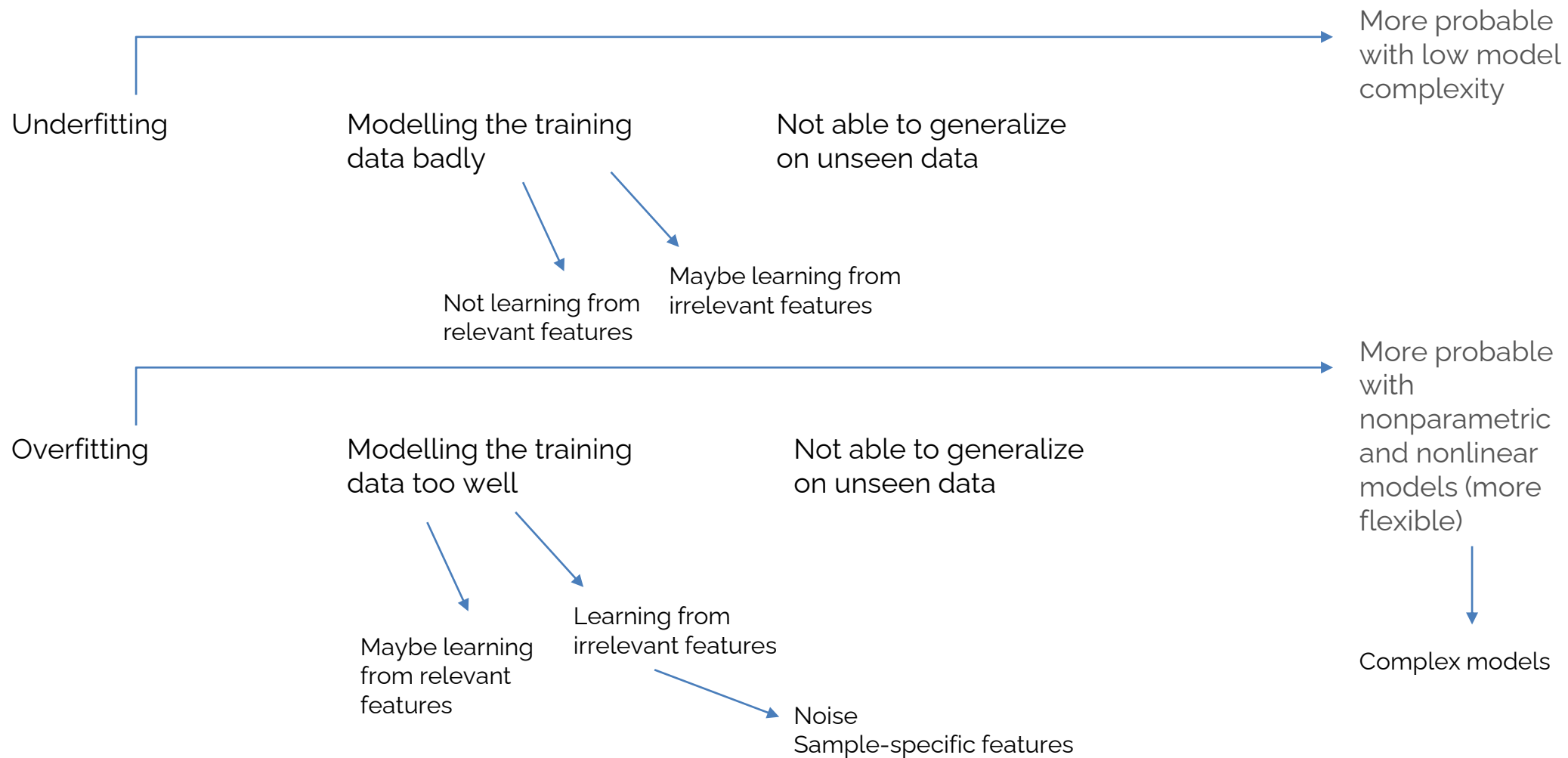
Christian Salvatore  
Scuola Universitaria Superiore IUSS Pavia

# UNDERFITTING / OVERFITTING

# Underfitting / Overfitting

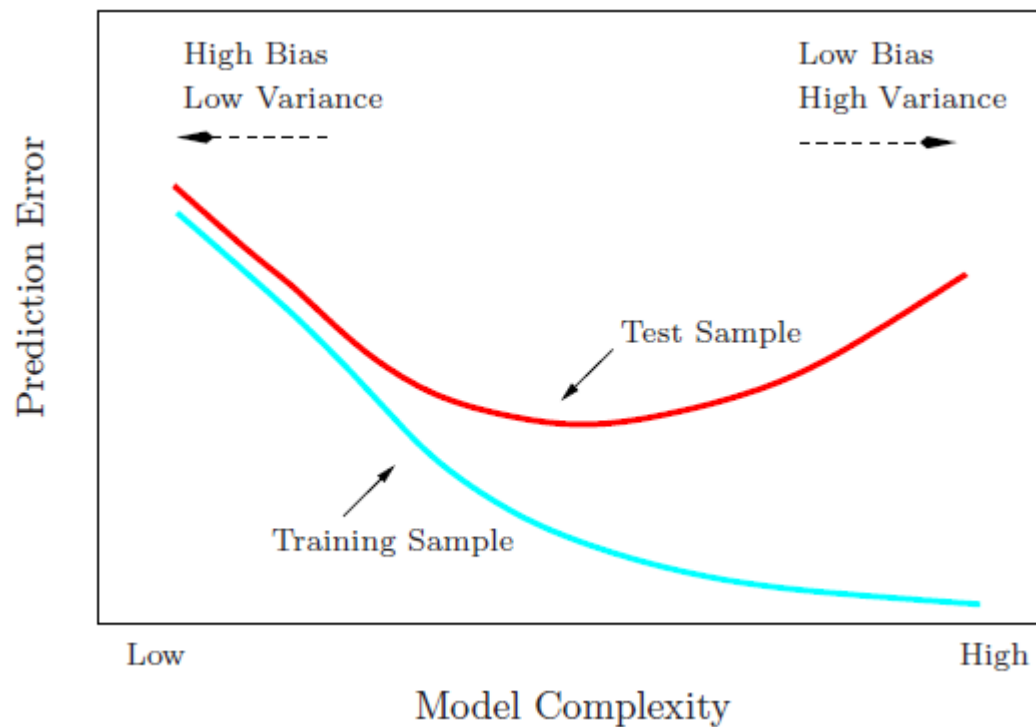


# Underfitting / Overfitting



How to notice: validate and test your results

# Underfitting / Overfitting



	Underfitting	Just right	Overfitting
<b>Symptoms</b>	<ul style="list-style-type: none"> <li>• High training error</li> <li>• Training error close to test error</li> <li>• High bias</li> </ul>	<ul style="list-style-type: none"> <li>• Training error slightly lower than test error</li> </ul>	<ul style="list-style-type: none"> <li>• Very low training error</li> <li>• Training error much lower than test error</li> <li>• High variance</li> </ul>
<b>Regression illustration</b>			
<b>Classification illustration</b>			
<b>Deep learning illustration</b>			
<b>Possible remedies</b>	<ul style="list-style-type: none"> <li>• Complexity model</li> <li>• Add more features</li> <li>• Train longer</li> </ul>		<ul style="list-style-type: none"> <li>• Perform regularization</li> <li>• Get more data</li> </ul>

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<https://christiansalvatore.github.io/machinelearning-iuss/>