



AWAKENING DATA SCIENCE IN CLAIMS RESERVING

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A first consideration:

Insurance business is a lot about data and analytics

...indeed...

it is a lot about 'predicting the future'

'predicting the future' is a lot about analytics...

...it is a lot about data science



Data science is a lot about:

“mining” data

modeling & exploration

Understanding & explaining results

‘scripting’ & coding





Actuaries are a lot about:

pricing

reporting

risk management

reserving





Very similar skills and mindset...

...sometimes different tools...

...sometimes different methods...

... sometimes different language...

...often different approaches...

Gradual awakening of data science in claims reserving

Different approaches and 'philosophies'



THE ACTUARIAL CLAIMS RESERVING

A high level overview



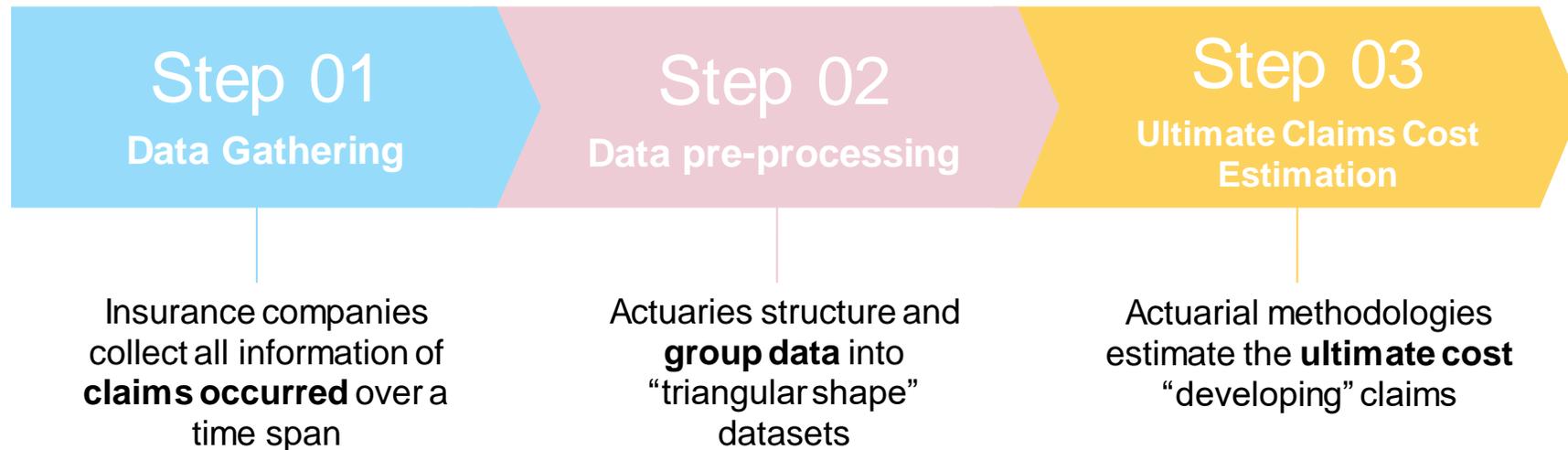


THE TRADITIONAL CLAIM RESERVING PROCESS

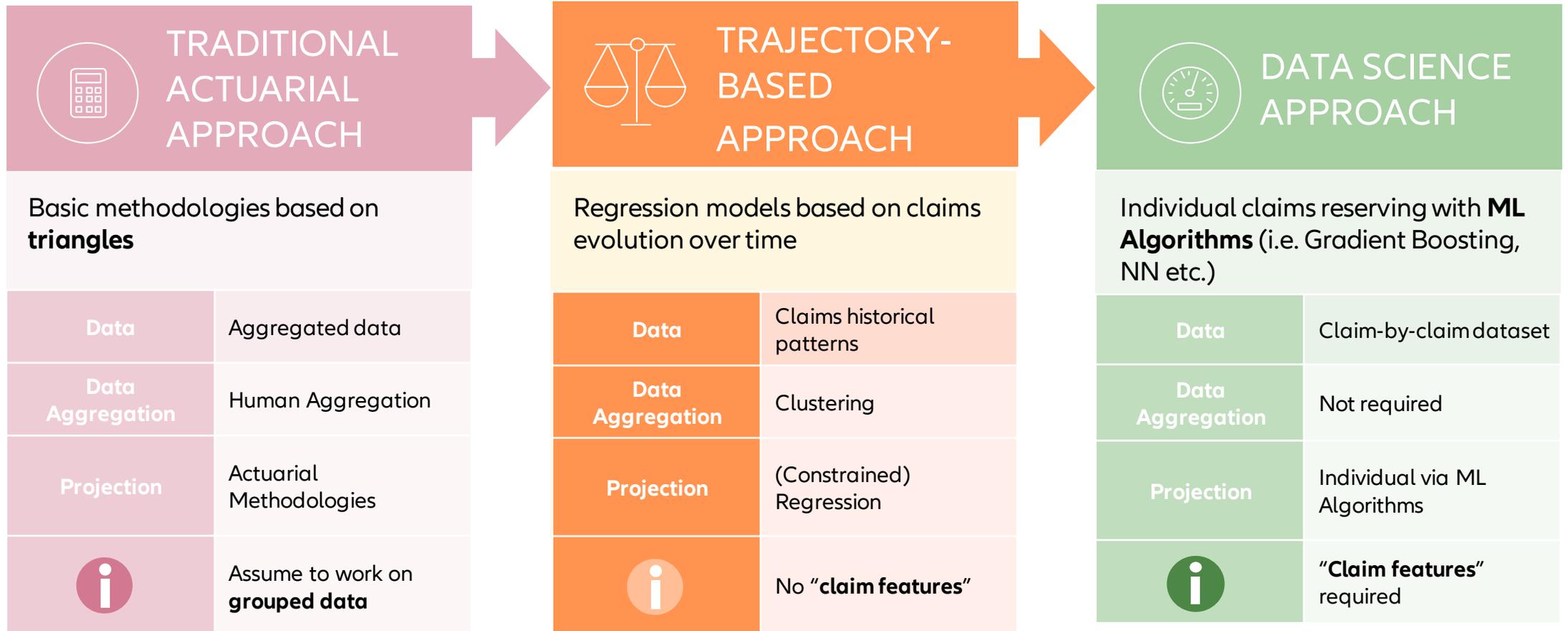


Claims Reserving:

Estimate and forecast the **outcome** for each potential claim (**Ultimate Claim Cost**) in the future to ensure that the company has enough **reserves** to fulfill liabilities



BRIDGING ACTUARIAL AND DATA SCIENCE WORLD



THE TRAJECTORY-BASED APPROACH

Gradual introduction of machine learning techniques into traditional claim reserving process

References:

ASTIN Colloquium 2019

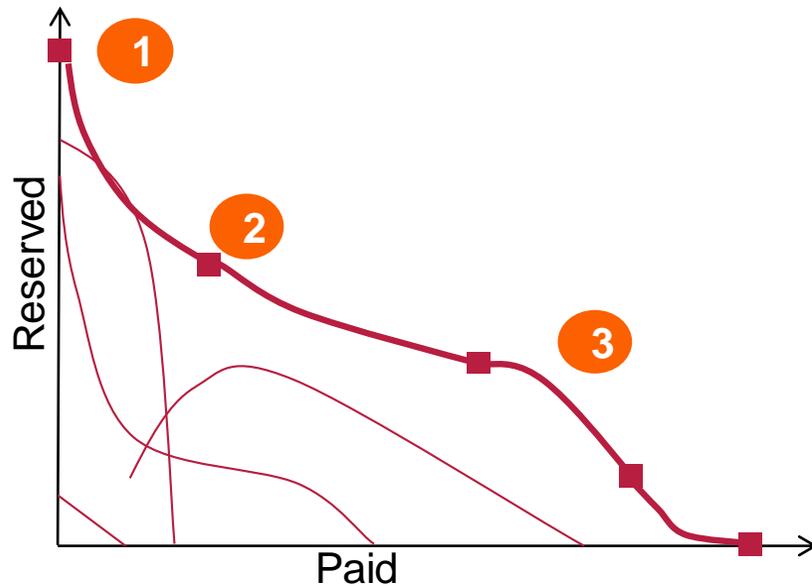
Carrato, Visintin

"From the Chain Ladder to Individual Claims Reserving using Machine Learning Techniques"

<http://bit.ly/2VzoNwg>



THE PAID-RESERVED TRAJECTORY



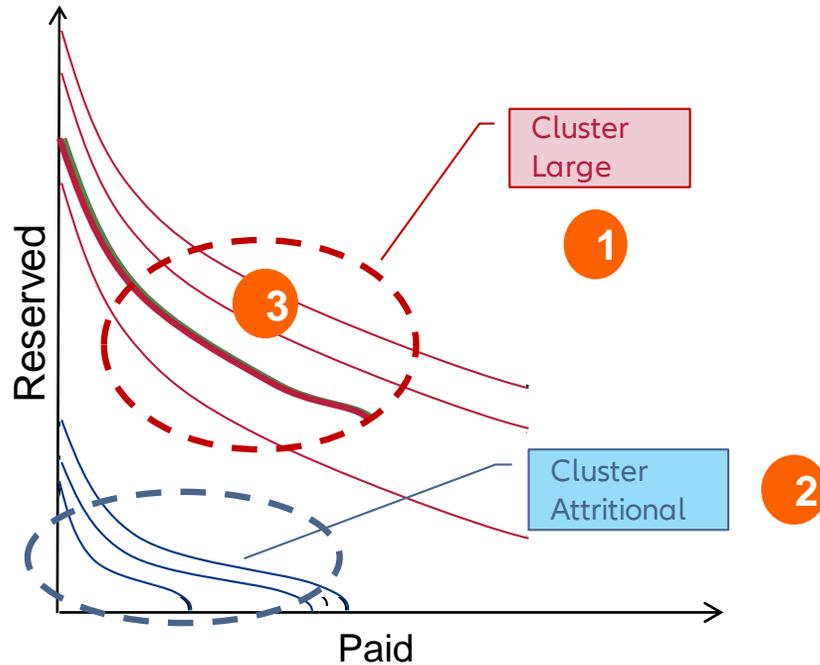
1. After its occurrence, a claim is reported and a case reserve is allocated

2. Subsequently, a certain amount is paid and the case reserve decreases accordingly

3. The claim continues its developing until is definitively closed (Ultimate Cost)

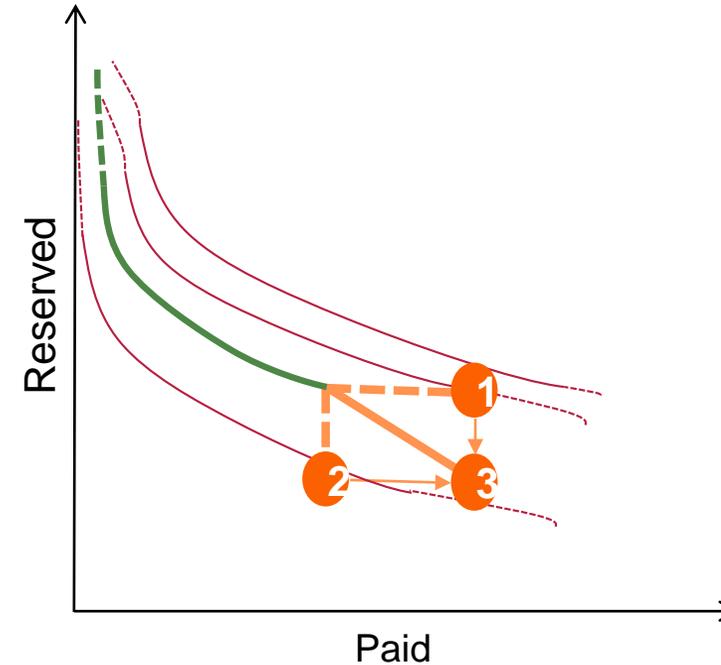
THE TWO-STEPS ALGORITHM

Step 1 – Clustering



> With clustering techniques, we are able to identify and aggregate claims with similar trajectories up to a fixed development period

Step 2 – Developing



> Two linear regression model, are fit on historical claims data to develop the paid amount (1) and the reserved amounts (2). Therefore, the projected point has coordinates defined by (1) and (2)

THE DATA SCIENCE APPROACH

Individual claims reserving with **ML Algorithms** (i.e. Gradient Boosting, NN etc.)

References:

Casualty Actuarial Society Working Paper (2020)

Cerqueti, De Virgilis

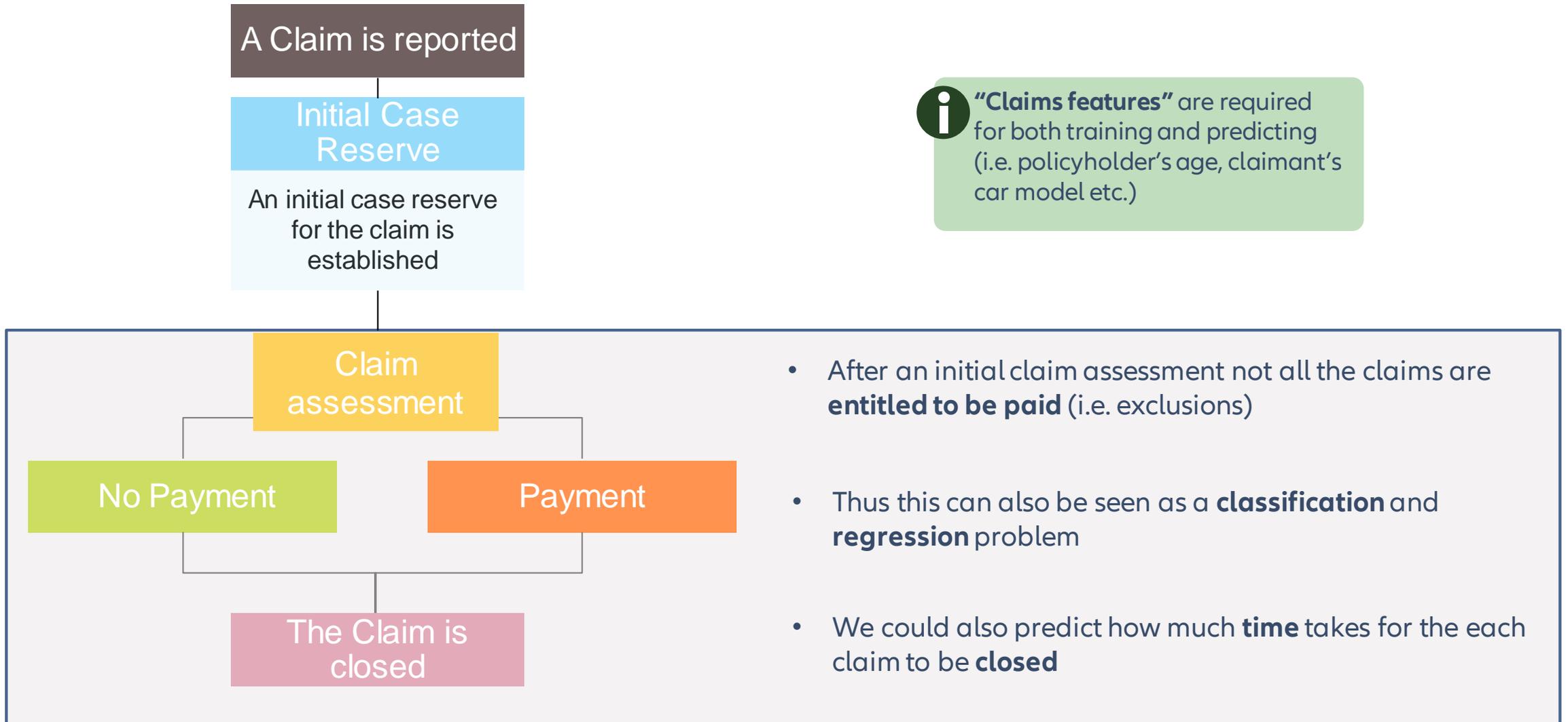
"Estimation of Individual Claim Liabilities – A comparison of Traditional and ML Methodologies"

<http://www.casact.org/research/wp/papers/working-paper-Virgilis-Cerqueti-2020-01.pdf>

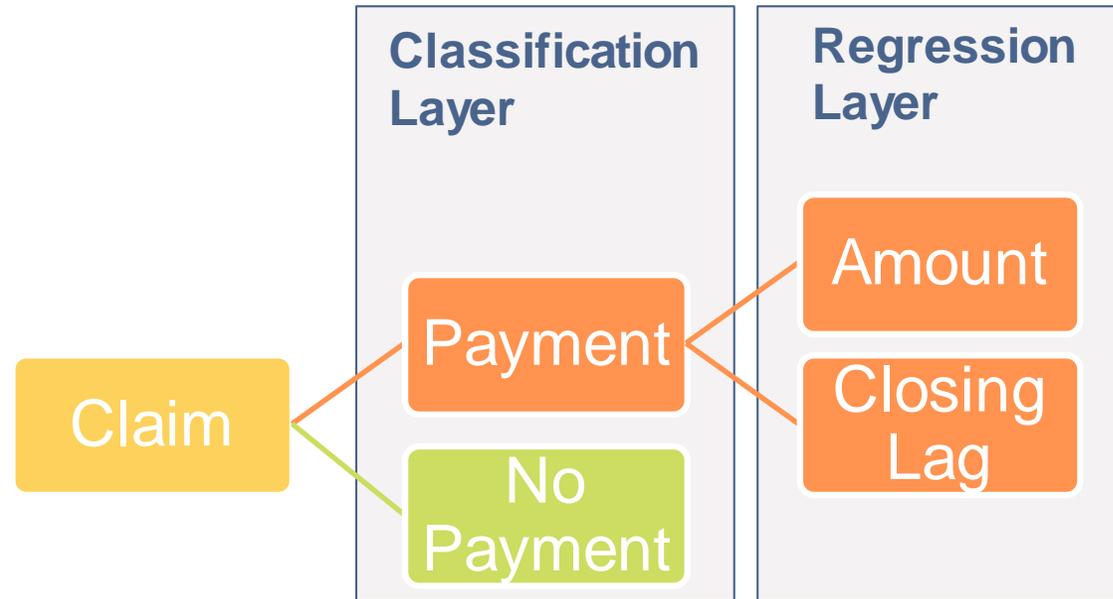




A NEW PARADIGM FOR INDIVIDUAL CLAIM RESERVING



MODELLING FRAMEWORK



1. First the a ML algorithm **classifies** whether a claim might be closed with **no payment**
2. If this first process will have a **negative outcome** (i.e. the claim will be paid), an **amount** will be calculated (**Ultimates**)
3. A third model will estimate the time that this process will take, from the moment the **claim is reported until it is closed (Closing lag)**
4. The **overall reserve** is then calculated by summing-up all the non-nil predicted amounts



The introduction of new approaches

respecting and gradually enhancing existing methodologies

'fertilizes' the awakening of the data science in claims reserving



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