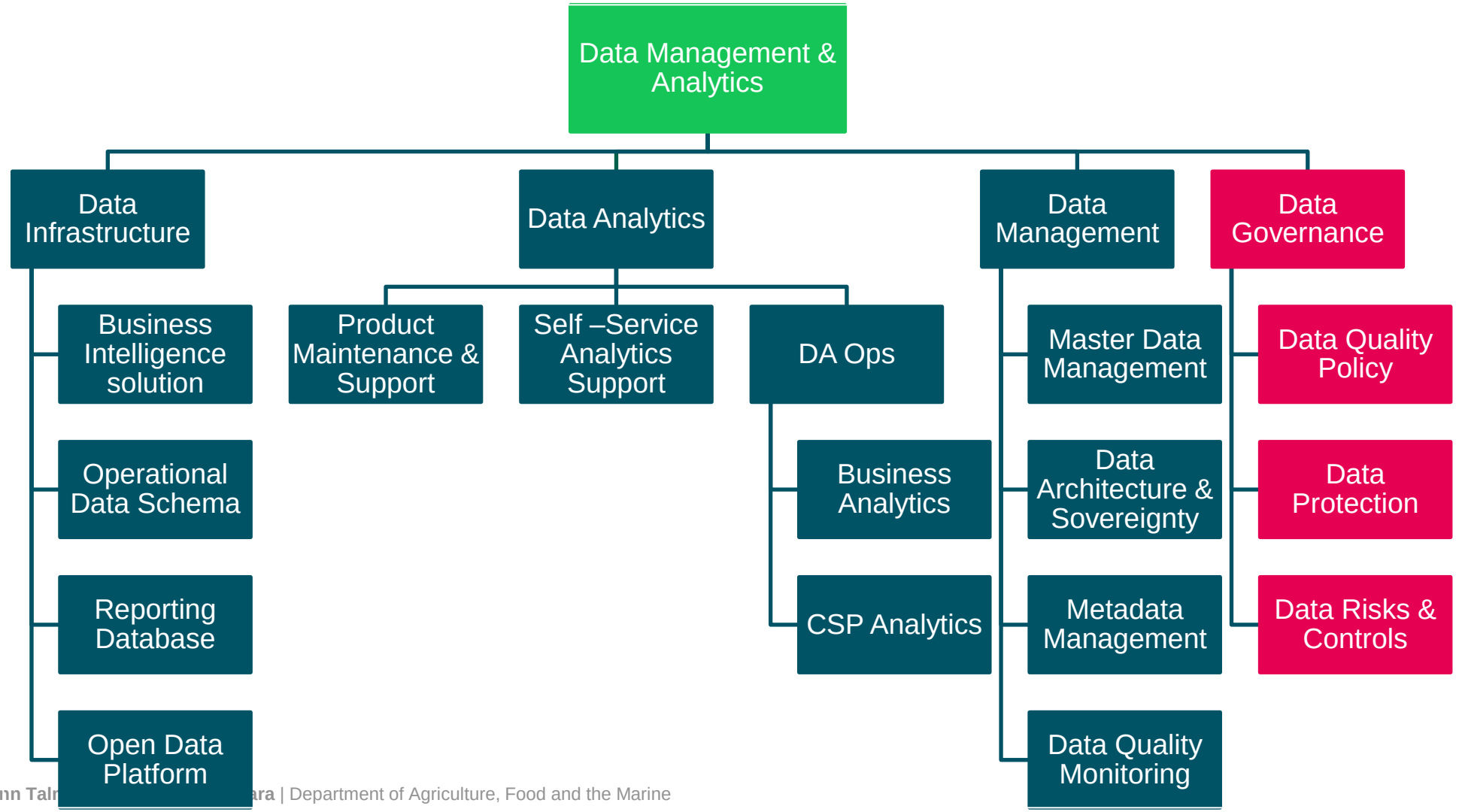
An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

Strategic Analytics in the Department of Agriculture, Food and the Marine

Catherine Dempsey, Data Management & Analytics, DAFM

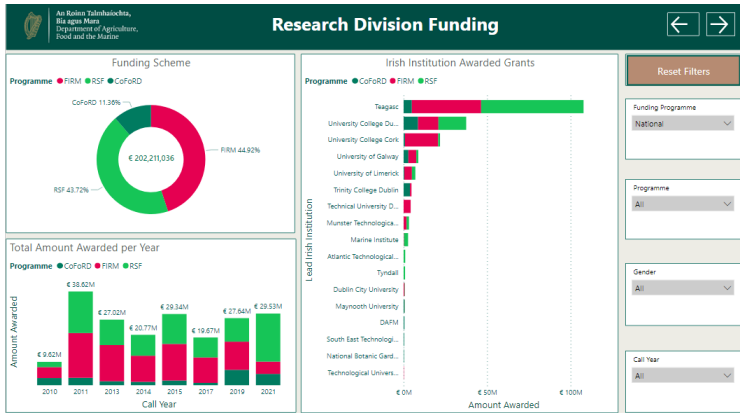
DAFM Data Operating Structure



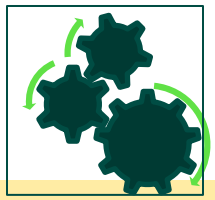
What is Operational Data Analytics?

Using an organisation's data to extract insight to support better decision making

DA_BUSINESS_REF_ID	DA_DATE_LAST_UPDATED	AMS_DATE_LAST_UPDATED	AMS_PIG_CENSUS_YEAR	AMS_PIG_CENSUS_DATE	AMS_PIG_COUNTY
1453652	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CARLOW
2220998	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CARLOW
1271263	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CARLOW
2406009	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CARLOW
2151132	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CARLOW
2150718	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CARLOW
2254111	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CARLOW
2363100	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CAVAN
2180692	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CAVAN
2071766	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CAVAN
1415761	06-OCT-2020	06-JUL-2010	2009	01-NOV-2009	CAVAN
2180791	06-OCT-2020	06-JUL-2010			
1378474	06-OCT-2020	06-JUL-2010			
1379190	06-OCT-2020	06-JUL-2010			
1925057	06-OCT-2020	06-JUL-2010			
20546655	06-OCT-2020	06-JUL-2010			
2326900	06-OCT-2020	06-JUL-2010			



- Structured
- Semi-structured
- Unstructured



Data → **Insights** → **Decisions**

- BI/Reporting
- Descriptive & Predictive Analytics

- Dashboards
- Decision support
- Automation

Data Ops

Business Understanding

Business case is drafted and approved and put into back log

Data Understanding

Functional Requirements gathering

Data Engineering

Pre-Ingestion

Data Ingestion

Data Transformation

Data Publication

Analtyical Development

Clean Data

Feature Engineering

Dashboard/ Model Development

Evaluation

Dashboard/Model UAT

Dashboard/Model PROD

Pilot

Deploy

QA log and Testing completed

Dependencies tested

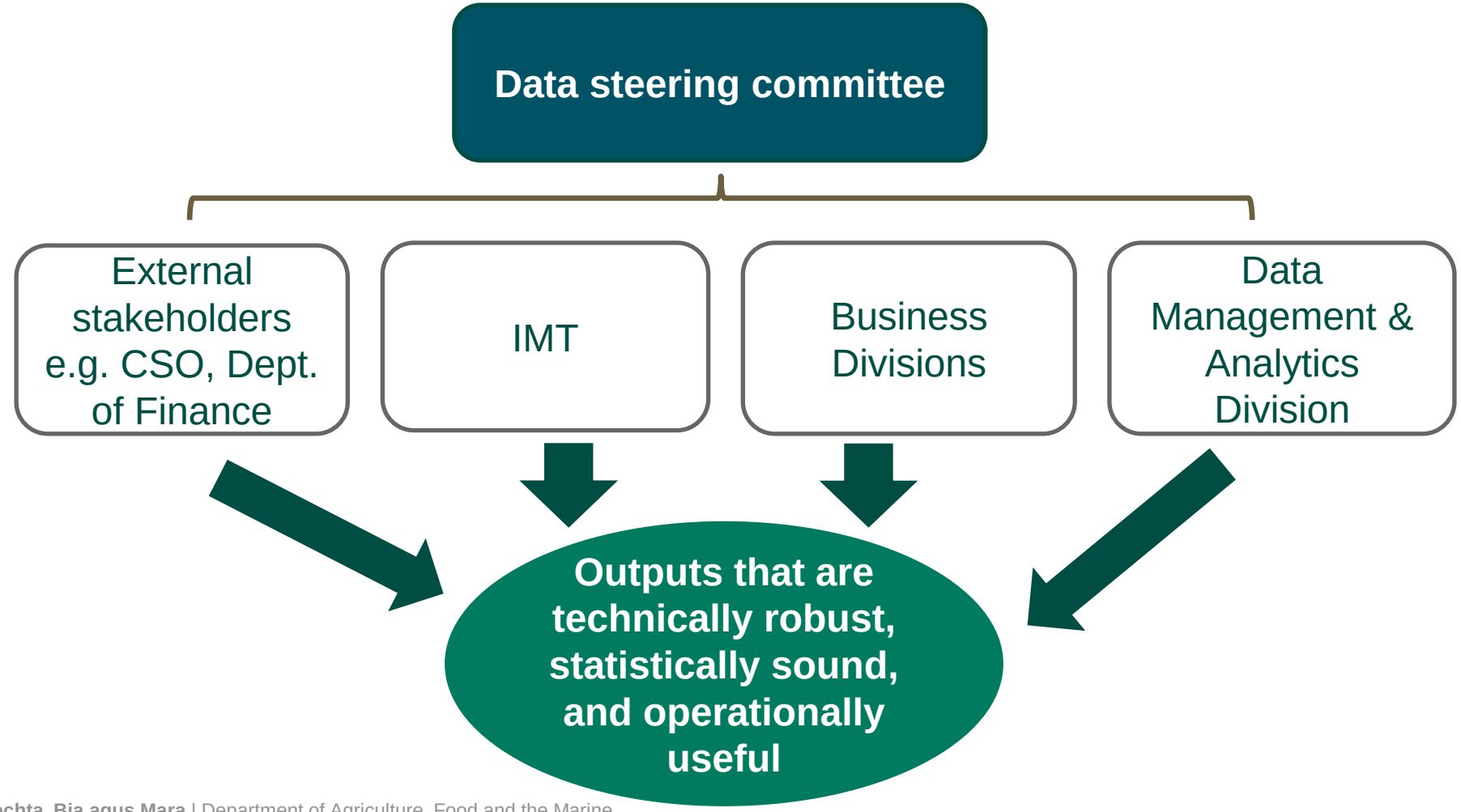
Training

Documentation published

Monitor and logging

monitor product in live environment

Strong governance ensures IT, operations, and analytics work together effectively to manage advanced analytics projects



Sources of Data in DAFM

Sources of Data in Agricultural Departments

Information from customers

- Registration, Central Customer Database
- Application forms, testing data, Animal tag data
- Customer contacts (Photographic data, telephone contacts, letters)

Information from third parties

- Government departments (e.g. CSO, OSI, Teagasc, EPA)
- Private sector (e.g. Abattoirs, Milk Processors, Shipping companies)

DAFM generated information

- Created from our activities (e.g. inspection results, test results, export certs issued)
- Derived data from other sources (e.g. Model scores, statistical data)
- Information about us (e.g. salaries, human resources data)

➢ **Structured or unstructured?**

372
21 -10597
50450
372
21 -10597
50450

75X5

Home
Farmer Dashboard
Farm Details
Entitlement Position
Transfers
NR-CISYF
Correspondence

My Application

Farmer Name Michael Mee | Herd Number D351028X

1 Active Farmer Status
2 Scheme Selection
3 Land Details
4 GAEC 8
5 Eco-Scheme
6 ACRES
7 SIM
8 Review & Submit

Scheme Selection

Please select the schemes you wish to apply for

BISS ✓ View details
Basic Income Support for Sustainability

CRISS ✓ View details
Complementary Redistributive Income Support for Sustainability

ANC ✓ View details
Areas of Natural Constraints (ANC) Scheme and Areas of Specific (Island Farming) Scheme (ASC)

Eco ✓ View details
Eco-Scheme

Organics View details
Organic Farming Scheme

SIM ✓ View details
Straw Incorporated Measure Scheme

Protein Aid Scheme View details
Protein Aid Scheme

ACRES ✓ View details
Agri-Climate Rural Environment Scheme

< Back

Next >

https://agfood.iprelive.agriculture.gov.ie/lpisinet/web/pages/dafm/home?sso_deeplink=true&GUID=F6EDDEFC14894769058...

InPrivate

Department of Agriculture, Food and the Marine | An Roinn Talmhaíochta, Bia agus Mara

Logged In As: aga6539 | Map: ACRES Farm Sustainability Plan - Editable | Scheme Type: General | ACRES Definitions Validation Matrix Settings Close Help

Undo Redo Undo Feature Redo Feature Clear Edits Save Edits

Select
- Select Feature
- Deselect All

Edit
- Draw
- Create WP
- Modify
- Move
- Delete

Measure
- Measure

Navigation
- Toggle Legend
- Return to Land Details

Draw

Barn Owl Nest Box

Cancel

- Barn Owl Nest Box
- Coppicing Of Hedgerows
- Extensively Grazed Pasture-SP
- Geese And Swans-SP
- Grass Margin Arable 3m
- Grass Margin Arable 4m
- Grass Margin Arable 6m
- Grass Margin Arable 8m
- Grass Margin Grassland 2m
- Grass Margin Grassland 3m

Snap

Drawing Features - To begin drawing within the layer specified in the drop down, click on the map to begin placing points. Choose a new layer from the drop down to change the layer you want to draw into.

0 75 150 meters

Search | Layers | Info | Thematics

Click a link to view feature info

All Parcels
E1250200050

Summary

Label:	E1250200050
Layer Name:	VWLP_PARCEL_LPIS_GIS_REF
Layer Title :	All Parcels
Unique ID :	902762008

History

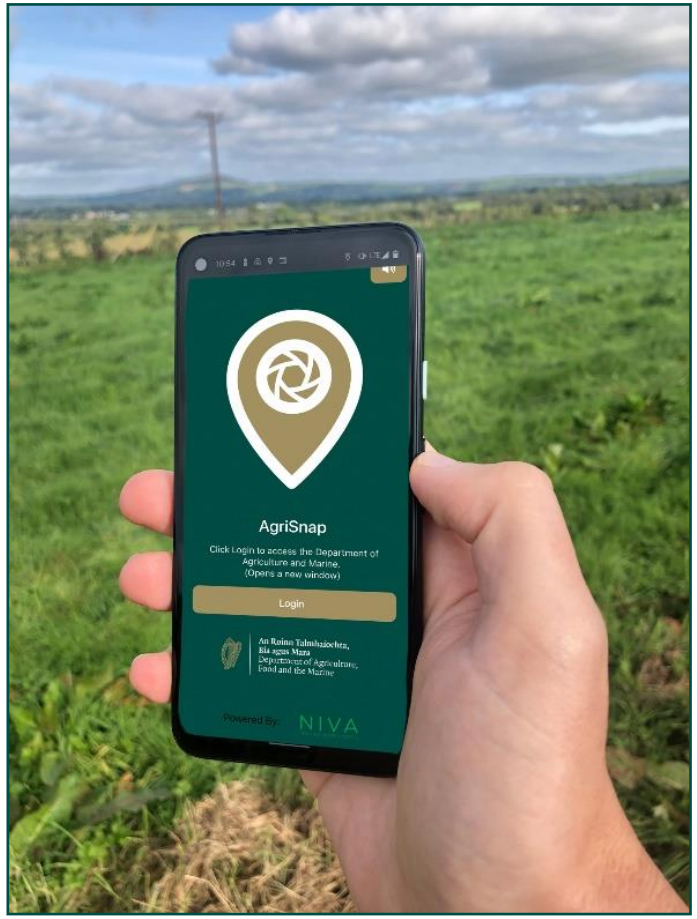
Attributes

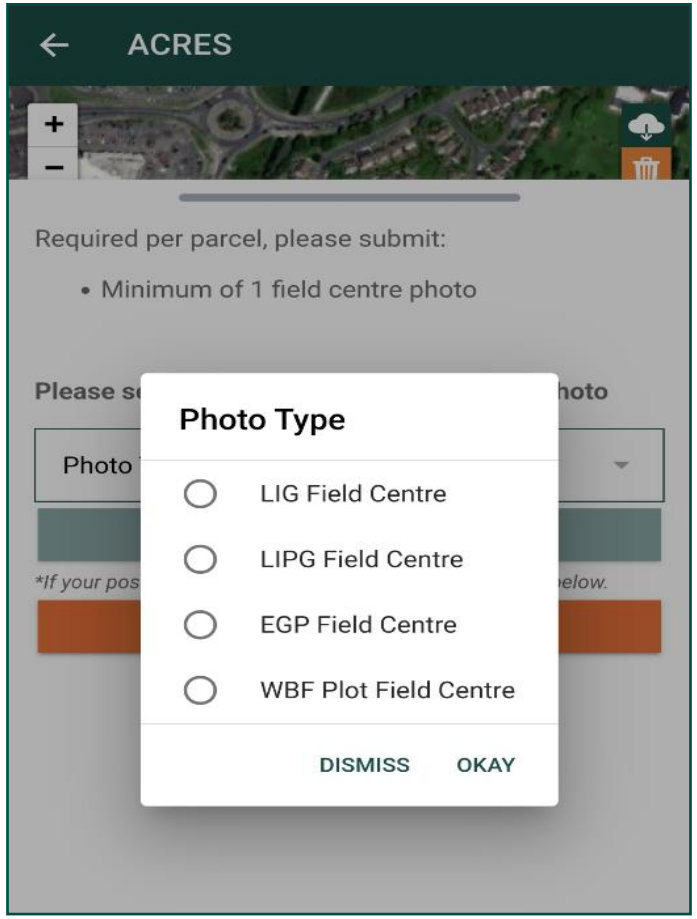
Area [HA]:	4.89
Perimeter:	1,685.2 Meters

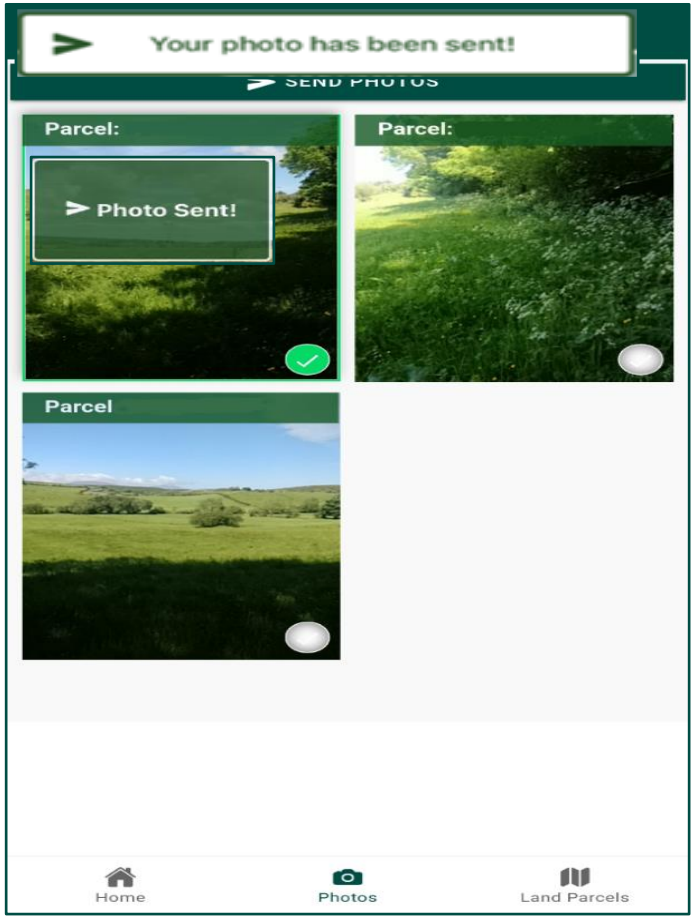
Geometry Information

Powered by spatial | Nominal Scale: 1:3760.00 | Center: 637760.53 / 928949.05 | Mouse Position: 637467.85 / 929182.77 | IRENET95 / Irish Transverse Mercator, (2157) | Version 6.3.8.38

AgriSnap geotagged photographs

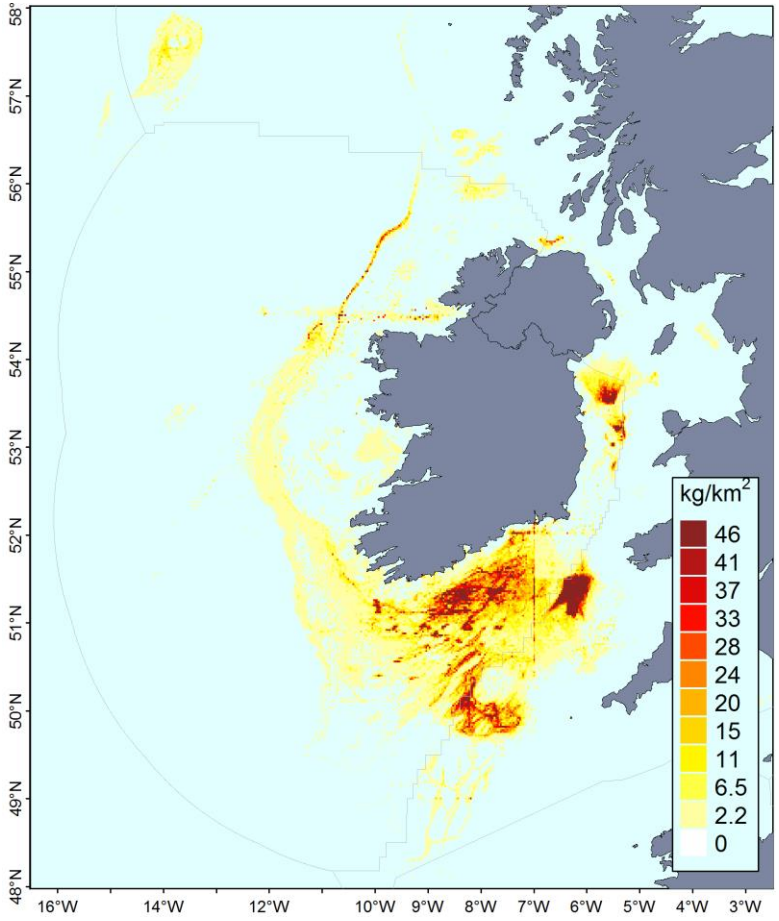


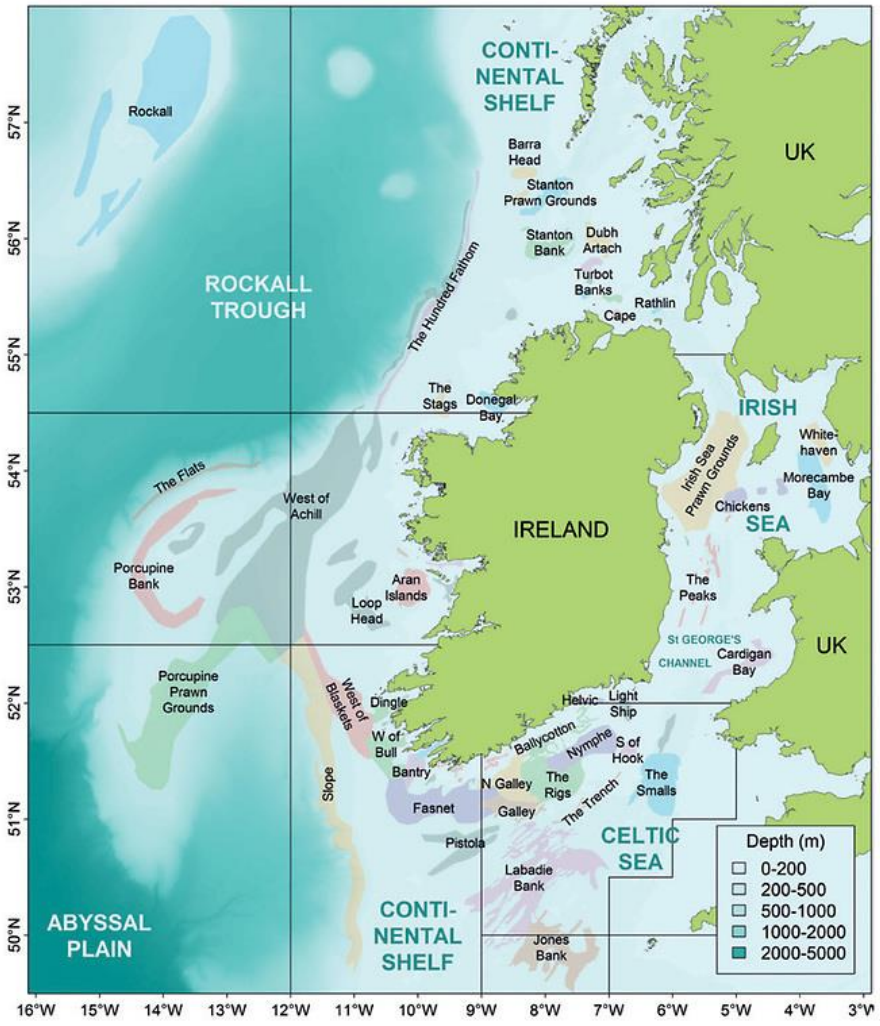




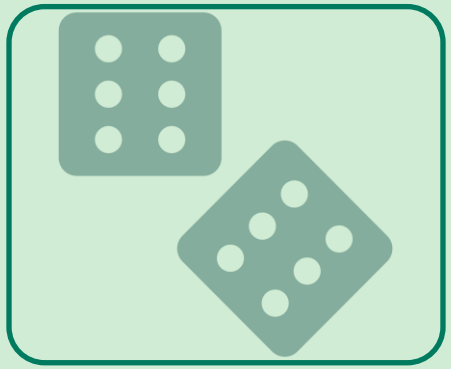
Fishery data

Fishery data





How we use DAFM data



Descriptive: what has happened?

Predictive: What could happen in the future based on past events?

Prescriptive: What should a business do?

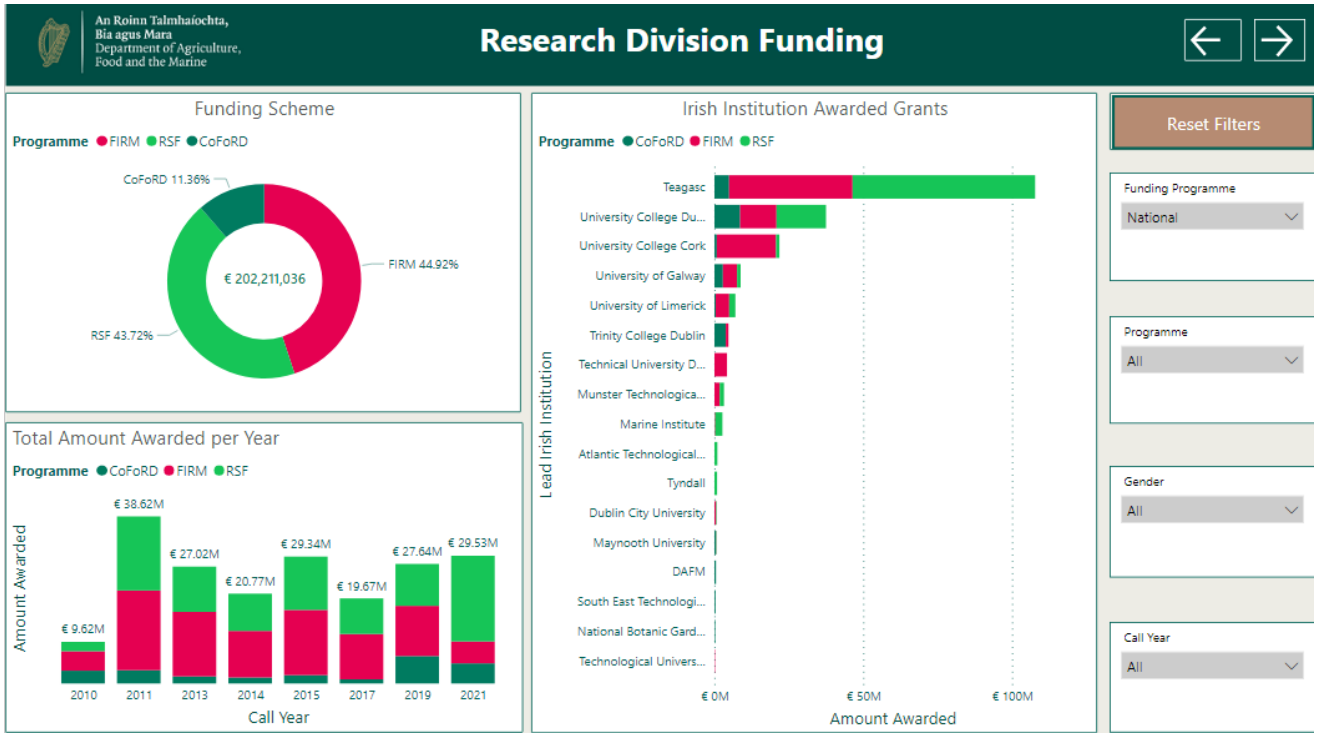
Descriptive analytics

What it is…

Use of statistical analysis and visualisations to explore and understand data
Identify interesting trends in current/past data etc.

Example: Research Division Dashboard

DAFM has a growing number of dashboards related to different aspects of its work
The dashboards provide some commonly used charts and tables to each division
Allows them to explore data and do custom analyses by defining their own ad-hoc queries and plots



Microsoft Power BI

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Department of Agriculture, Food and the Marine

Research Themes

€ 202.21M	327	17	200	€ 618.38K
Total Awarded	Number of Signed Grants	Number of Lead Irish Institution	Number of Lead Coordinators	Average Award per Project

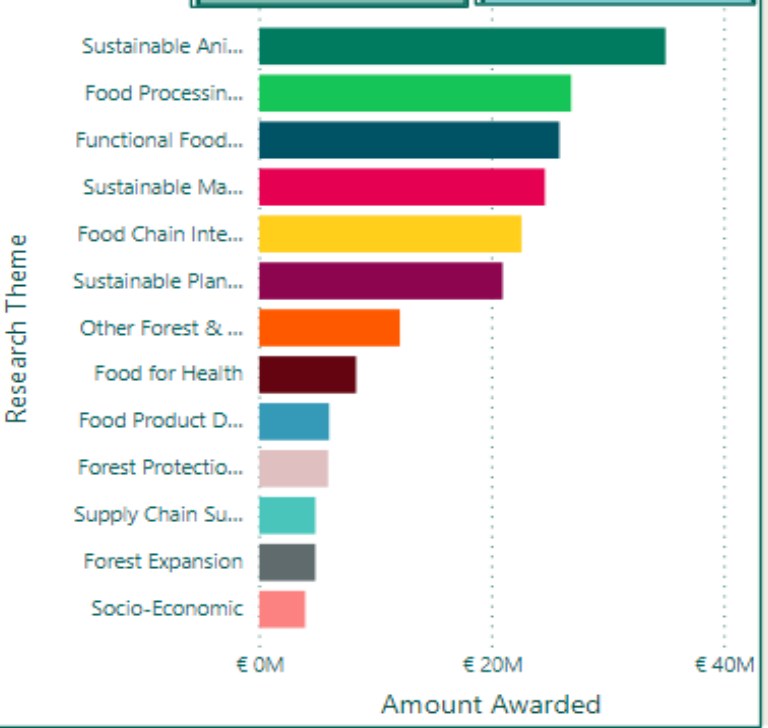
Food Chain Integrity & Safety | Food for Health | Food Processing Technology | Food Product Development | Forest Expansion | Forest Protection & Utilisation | Functional Foods & Health | Other Forest & Misc | Socio-Economic | Supply Chain Sustainability | Sustainable Animal Production | Sustainable Management of Natural Resources

Signed Grants By Theme

Research Theme

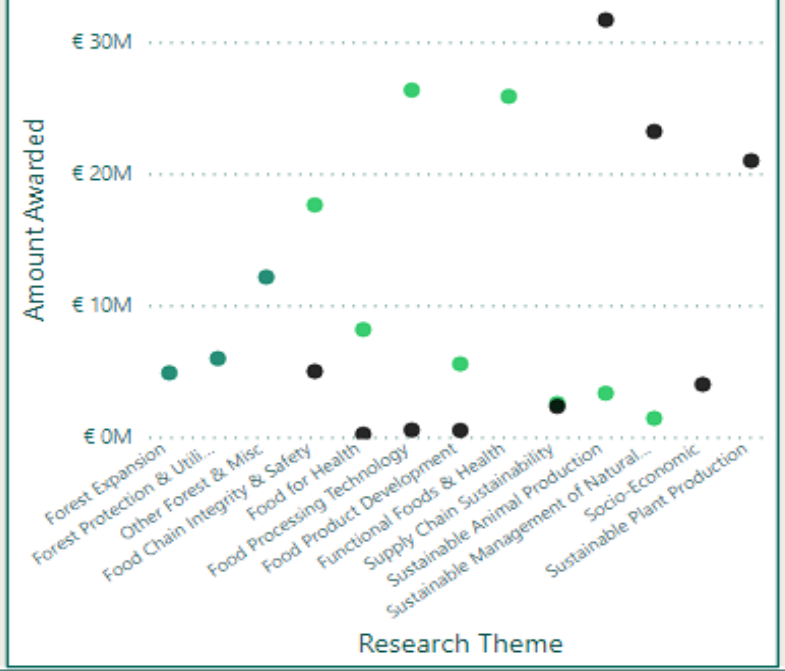
- Sustainable Animal Prod...
- Food Processing Technol...
- Functional Foods & Health
- Sustainable Managemen...
- Food Chain Integrity & S...
- Sustainable Plant Produc...
- Other Forest & Misc
- Food for Health
- Food Product Developm...
- Forest Protection & Utilis...
- Supply Chain Sustainability
- Forest Expansion
- Socio-Economic

Signed Grants By Theme | Lead Institution Funding



Amount Awarded per Thematic Area

Programme CoFoRD FIRM RSF



Reset Filters

Funding Programme
National

Programme
All

Gender
All

Call Year
All

What is AI in DAFM?

Artificial Intelligence

Agricultural Inspector

Avian Influenza

Artificial Insemination

What is Artificial Intelligence in DAFM?

software components (models) that allow systems/applications to recognise and bring context to patterns in data without the rules having to be explicitly programmed by a human.

generate predictions, recommendations, or decisions based on statistical reasoning – Trad AI

create content based on a series of predictions – GenAI

Prescriptive analytics

Data Selection

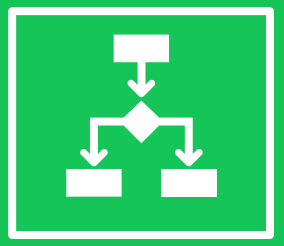
Farm description dataset, joined with relevant customer data and a binary flag for Forest Owner

Feature Selection

Identifying the variables that carry information for predicting whether a client is a Forest Owner or not

Modelling

- Decision Trees were modelled
- Method of categorising clients based on a set of questions to be answered



Dashboard

- A Dashboard was built visualising the top features
- This Dashboard was built in PowerBI

Forestry Dashboard

This dashboard visualises the top features for classifying Forest Owners from the Forestry Customer Segmentation Project

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Department of Agriculture, Food and the Marine

16.97K
Forest Owners

122.56K
Non-Forest Owners

Count of Forest Owners by Their Business Start Year

Client Age

0 — 94

Client Gender

All

Client County

All

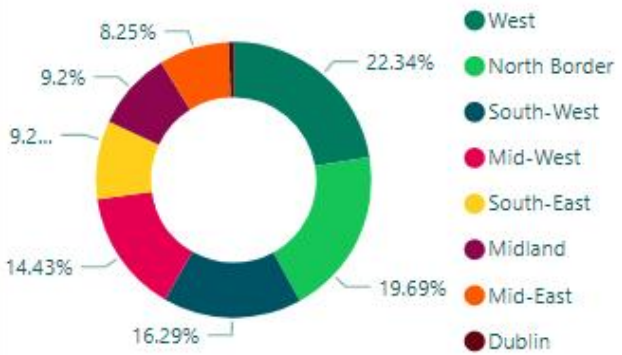
Client Type

All

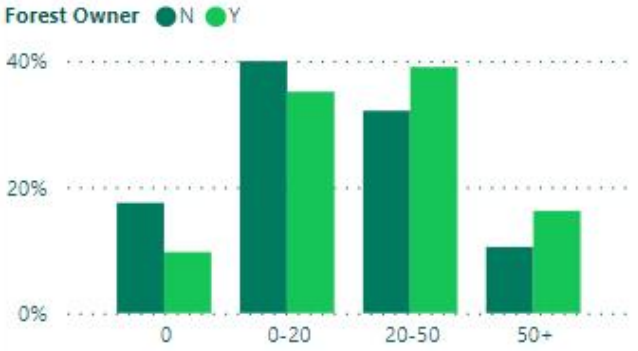
Farm Type

All

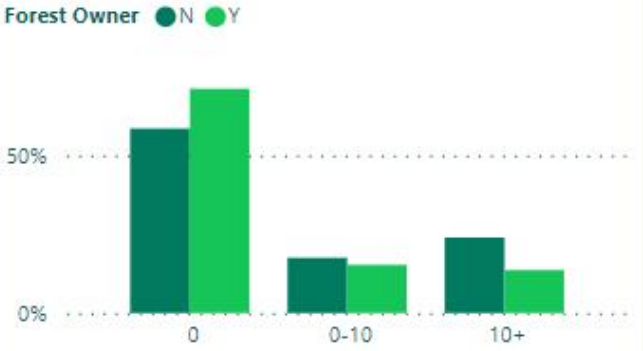
Count of Forest Owners by Region



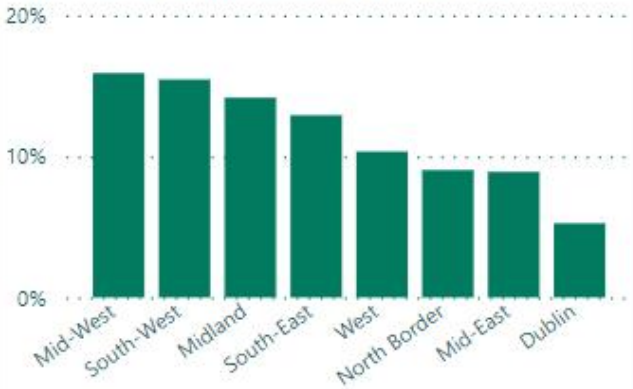
Distribution of Area Eligible Owned (HA) for Forest Owners vs Non-Forest Owners



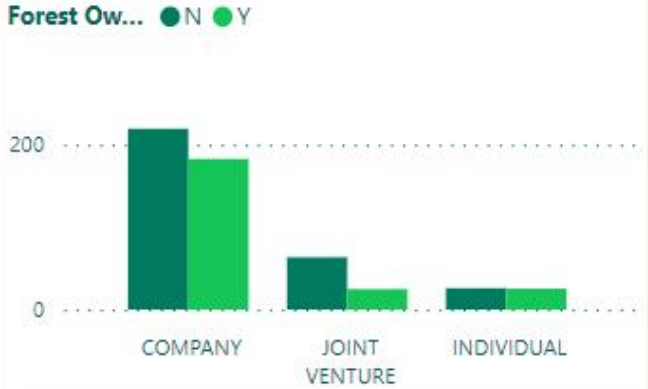
Distribution of Area Eligible Rented & Leased (HA) for Forest Owners vs Non-Forest Owners



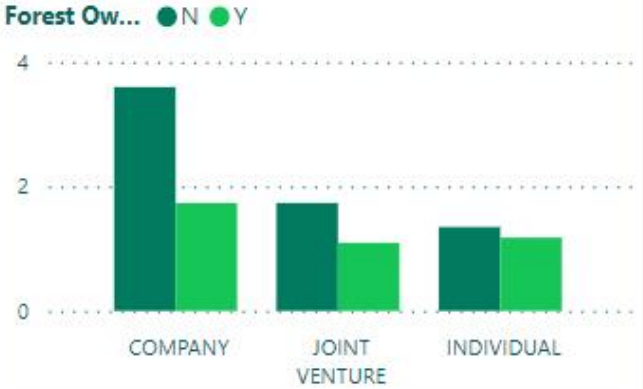
Ratio of FO's to No. of Farmers by Region



Average Client ESU Value



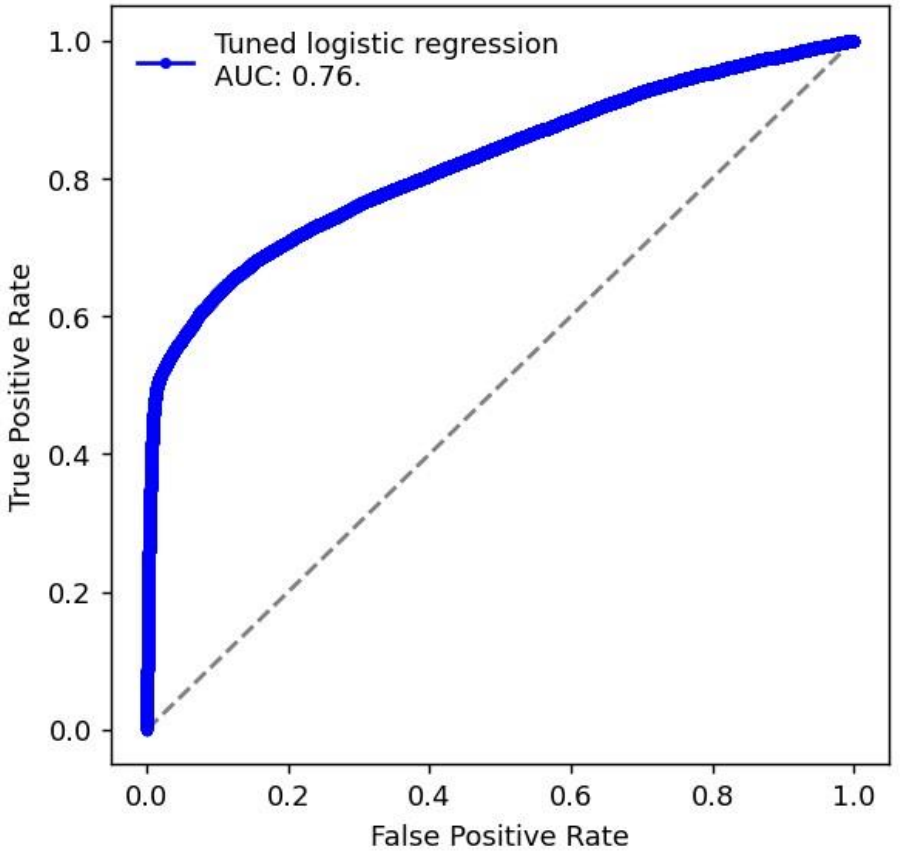
Average Client Stocking Density



Dublin Mid-East Midland

Predictive Analytics: An operational machine learning model to predict TB risk

- 3 years of data already cleaned including demographic, TB testing and farm characteristics data.
- Leverage previous academic work including pilot model already developed through an academic collaboration with the Roslin Institute.
- TB mapping application already deployed will host model



Our Public Service

Future Tech Challenge

TB Mapping Application in R Shiny

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Department of Agriculture, Food and the Marine

TB Monitoring Maps

Select a date range: dd/mm/yyyy

30/09/2020 to 30/09/2021

Select a county

Clare, Cork South, Cork North, Tip South, Tip North, Kerry, Limerick,

Click to load county

Select a variable to view:

Number of Herds With TB+

Select a choice of bin widths:

National Local

Select text labels to show on districts with positive reactors:

No Labels

Included positive test locations (point co-ordinates)

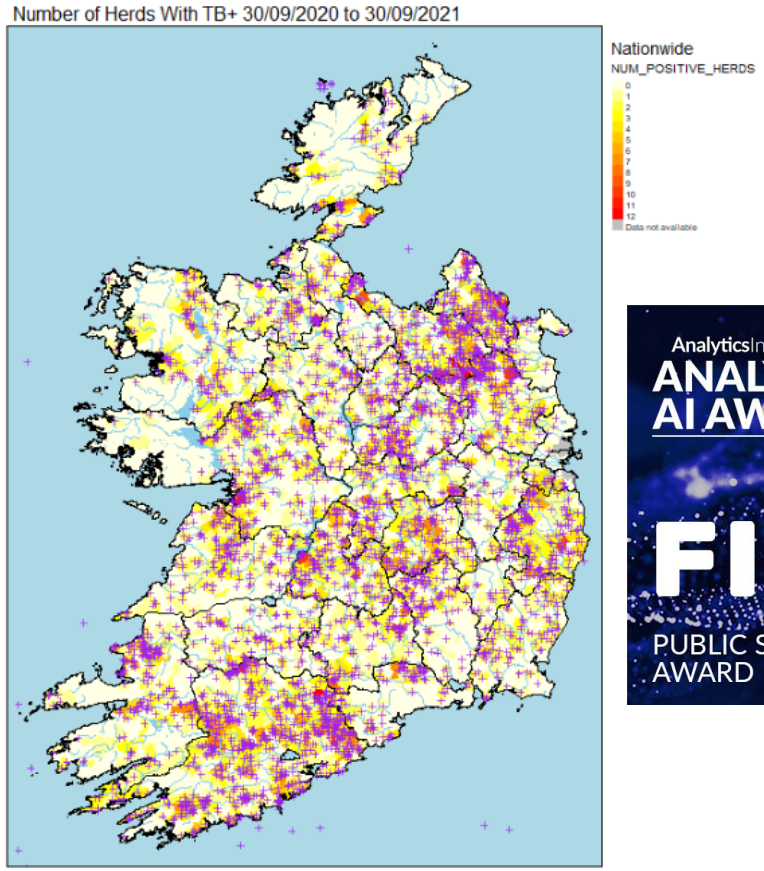
Size test locations by number of reactors:

Click below to download a copy of the map:

(Please wait 60-90 seconds for download to finish before clicking again)

PNG JPG PDF

Export Map Images | Data Viewer



Deep learning in DAFM - H5N1 Bird Identification

BirdWatchIreland
protecting birds and biodiversity

The Cornell Lab of Ornithology
Macaulay Library

Step 1

Gathering lots of image data from various sources

Cleaning data to achieve similarity

Step 2

TensorFlow

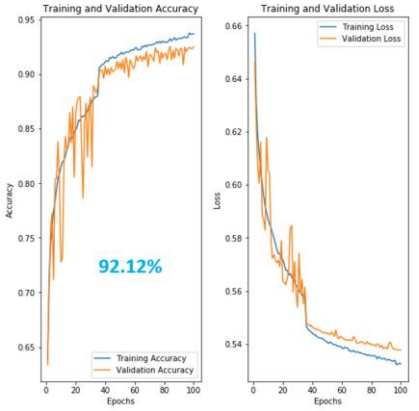
Keras

Step 3

Implementation - Building Selecting the right ML algorithm

Gaining insights from the model's results

Step 4



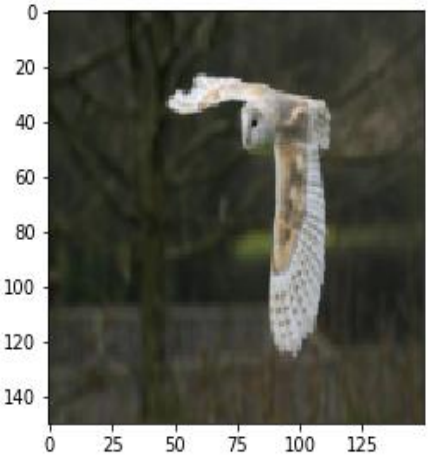
Step 5

Data Visualization – Transforming results into visual graphs

Predictions

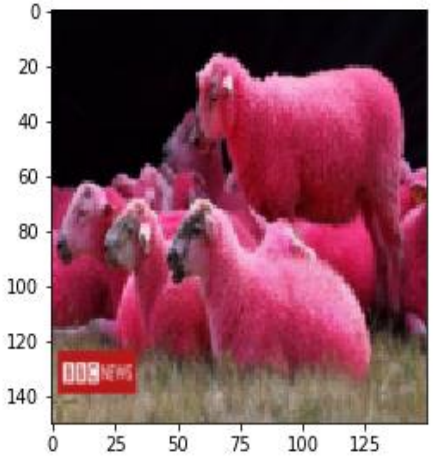
Bird 56.48%

<matplotlib.image.AxesImage at 0x274ad715a88>



Not a Bird 100.00%

<matplotlib.image.AxesImage at 0x274afa71308>



Not a Bird 100.00%

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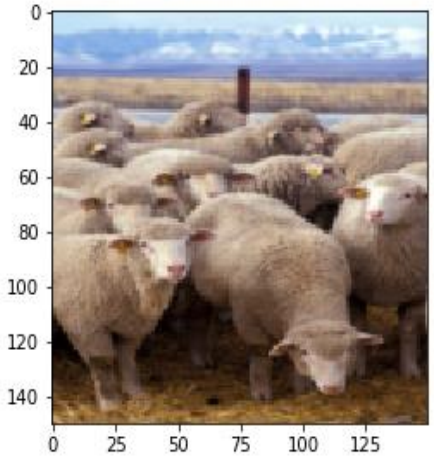

Not a Bird 100.00%

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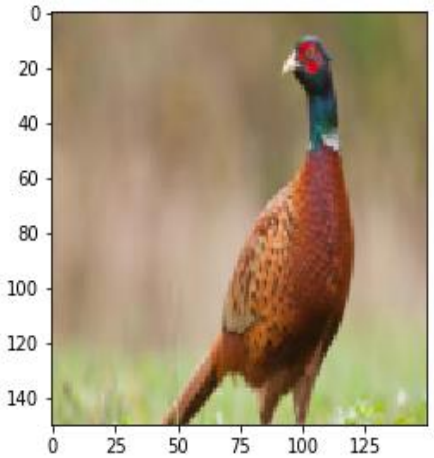
Not a Bird 62.35%

<matplotlib.image.AxesImage at 0x274b00eea88>



Bird 88.69%

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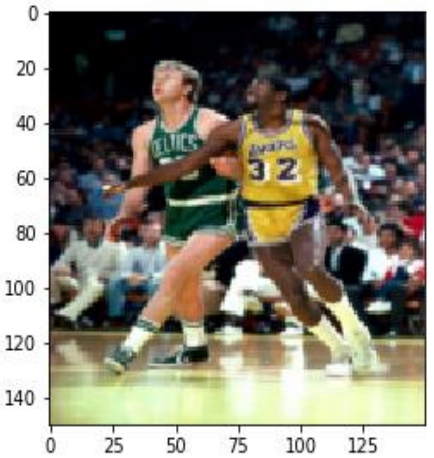
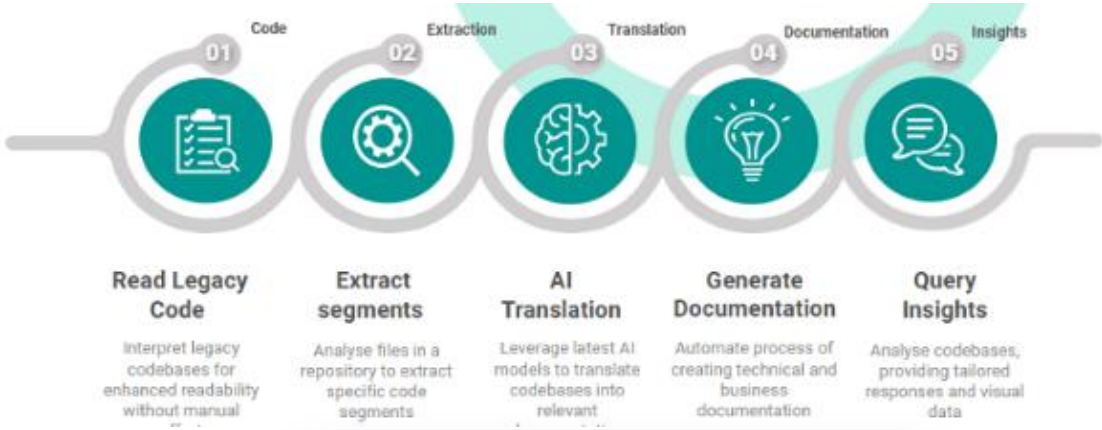


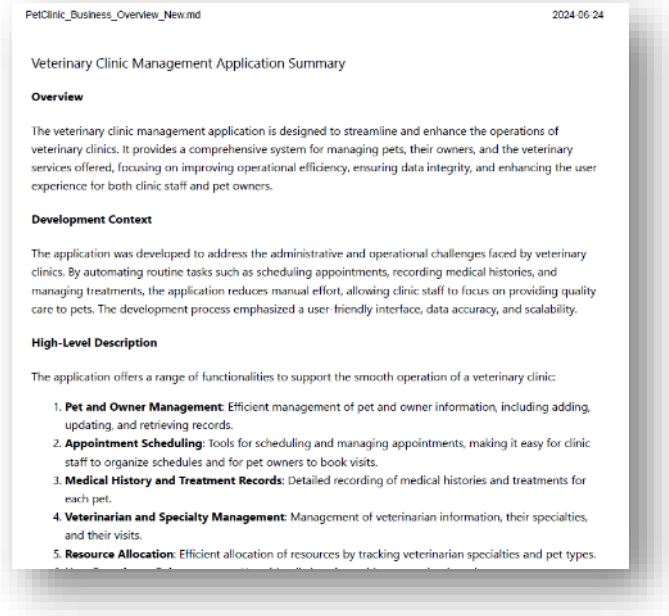
Exploratory GenAI projects

IT System design and delivery support

Decipher: Analyse content (code) to produce documentation that summarises the purpose of an application, its design, the rules used, and ways to improve its function and performance

Accelerator: Preparing test scenarios manually is one of the key elements of the software development process to ensure the highest quality. AI potentially can reduce time spent on these tasks by 95%





PetClinic_Business_Overview_New.md 2024-06-24

Veterinary Clinic Management Application Summary

Overview

The veterinary clinic management application is designed to streamline and enhance the operations of veterinary clinics. It provides a comprehensive system for managing pets, their owners, and the veterinary services offered, focusing on improving operational efficiency, ensuring data integrity, and enhancing the user experience for both clinic staff and pet owners.

Development Context

The application was developed to address the administrative and operational challenges faced by veterinary clinics. By automating routine tasks such as scheduling appointments, recording medical histories, and managing treatments, the application reduces manual effort, allowing clinic staff to focus on providing quality care to pets. The development process emphasized a user-friendly interface, data accuracy, and scalability.

High-Level Description

The application offers a range of functionalities to support the smooth operation of a veterinary clinic:

1. **Pet and Owner Management**: Efficient management of pet and owner information, including adding, updating, and retrieving records.
2. **Appointment Scheduling**: Tools for scheduling and managing appointments, making it easy for clinic staff to organize schedules and for pet owners to book visits.
3. **Medical History and Treatment Records**: Detailed recording of medical histories and treatments for each pet.
4. **Veterinarian and Specialty Management**: Management of veterinarian information, their specialties, and their visits.
5. **Resource Allocation**: Efficient allocation of resources by tracking veterinarian specialties and pet types.

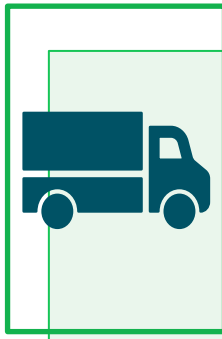
AI Risks

Algorithmic bias: AI may make use of biased source data and generate biased, discriminatory or offensive content and results.

Reputational Risk: When AI systems violate social norms and values, organisations are at great risk, as single events have the potential to cause lasting damage to their reputation.

AI decision making: AI does not replace human judgment and, in some cases prevent informed and contextualised decision-making

Climate: AI uses significant compute resources, particularly GenAI. This may impact our green IT goals.



Supply Chain: The supply chain to support GenAI and in particular GPU is fragile. Building capabilities on GenAI must take this into account.

EU AI Act Cheat-sheet

THE BASICS

- **Definition of AI:** aligned to the recently updated OECD definition
- **Extraterritorial:** applies to organisations outside the EU
- **Exemptions:** national security, military and defence; R&D; open source (partial)
- **Compliance grace periods** of between 6-24 months
- **Risk-based:** Prohibited AI >> High-Risk AI >> Limited Risk AI >> Minimal Risk AI
- **Extensive requirements** for 'Providers' and 'Users' of High-Risk AI
- **Generative AI:** Specific transparency and disclosure requirements

PROHIBITED AI

- **Social credit scoring** systems
- **Emotion recognition** systems at work and in education
- AI used to **exploit people's vulnerabilities** (e.g., age, disability)
- **Behavioural manipulation a**nd circumvention of free will
- **Untargeted scraping of facial images** for facial recognition
- **Biometric categorisation systems** using sensitive characteristics
- Specific **predictive policing** applications
- **Law enforcement use of real-time biometric identification in public** (apart from in limited, pre-authorised situations)

HIGH-RISK AI

- **Medical devices**
- **Vehicles**
- **Recruitment, HR and worker management**
- **Education** and vocational training
- Influencing **elections and voters**
- **Access to services** (e.g., insurance, banking, credit, benefits etc.)
- **Critical infrastructure** management (e.g., water, gas, electricity etc.)
- **Emotion recognition** systems
- **Biometric identification**
- **Law enforcement, border control, migration and asylum**
- Administration of **justice**
- **Specific products** and/or **safety components** of specific products

KEY REQUIREMENTS: HIGH-RISK AI

- **Fundamental rights impact assessment** and **conformity assessment**
- Registration in **public EU database** for high-risk AI systems
- **Implement risk management** and **quality management** system
- **Data governance** (e.g., bias mitigation, representative training data etc.)
- **Transparency** (e.g., Instructions for Use, technical documentation etc.)
- **Human oversight** (e.g., explainability, auditable logs, human-in-the-loop etc.)
- **Accuracy, robustness and cyber security** (e.g., testing and monitoring)

GENERAL PURPOSE AI

- Distinct requirements for **General Purpose AI** (GPAI) and **Foundation Models**
- **Transparency** for all GPAI (e.g., technical documentation, training data summaries, copyright and IP safeguards etc.)
- Additional requirements for **high-impact models with systemic risk**: model evaluations, risk assessments, adversarial testing, incident reporting etc.
- **Generative AI:** individuals must be informed when interacting with AI (e.g., chatbots); AI content must be labelled and detectable (e.g., deepfakes)

PENALTIES & ENFORCEMENT

- Up to **7% of global annual turnover** or €35m for prohibited AI violations
- Up to **3% of global annual turnover** or €15m for most other violations
- Up to **1.5% of global annual turnover** or €7.5m for supplying incorrect info
- **Caps on fines for SMEs and startups**
- **European 'AI Office'** and **'AI Board' established** centrally at the EU level
- **Market surveillance authorities** in EU countries to enforce the AI Act
- **Any individual can make complaints** about non-compliance

Not yet enacted. Political agreement reached on 8 December 2023.

AI Risk Mitigation

Practice

1. Human agency and oversight
2. Technical robustness and safety
3. Privacy and data governance
4. Transparency
5. Diversity, non-discrimination, and fairness
6. Societal and environmental well-being
7. Accountability

Governance

DATA STEERING COMMITTEE

DATA ANALYTICS BOARD

DATA PROTECTION

ENTERPRISE ARCHITECTURE

INFORMATION SECURITY

EU AI ACT/LIABILITY ACT

AI Risk Mitigation

Principles

1. Human agency and oversight
2. Technical robustness and safety
3. Privacy and data governance
4. Transparency
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Data Analytics
Quality Assurance
Policy

ARTIFICIAL INTELLIGENCE (AI) POLICY

Information Security Management
ISO
27001
Certified

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Thanks!