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  Artificial Intelligence for Environmental Risk

MRes project report 2022

Optimising remote field station supplies

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# Abstract

Background

Aims

Conclusion

What can be done next

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# Introduction

British Antarctic Survey

What they want to do and why

Edmund’s work

Constraint optimization

Aims

# Background

## Rothera Research Station

How food is currently organised

## Objectives

Why do we want to do this project

What do we hope to achieve

# Methodology

## Communication

Meetings with BAS

Emails

## Data and Technology

Which data were used

Not all data were available

Which data were guessed and how

Raw data were not altered

MiniZinc

Python

GitHub

Trello

FAIR Data

GDPR

## Dietary Requirements

Macronutrients

Vitamin D

Gender and age

Job roles

Field trips

Allergies and restrictions

Different meals, treats and alcohol

Variety and enjoyment

## Transportation

Ship

Planes

Fuel calculations

No planes in winter

## Practical Considerations and Assumptions

Purchasing

Storage

Cooking

Packaging

Meal times and structure

Menu, buffet, pre-planned menu or prescribed

Problems with the buffet style approach

Alternatives to the buffet stye approach

## Constraint Modelling

MiniZinc

Choosing which things to model as constraints (fixed) and which to optimize (flexible)

Explain constraints and justify them

Problems and alternatives

Explain why code is repeated (faster loop unrolls, enumerable types).

## Solving Technique

How Geocode works.

Why I chose it.

What else could be used.

Floats.

Explain why numbers are scaled up or down later.

Batches of data.

## Objective Function

Benchmarks

Trade-off between objectives, constraints and processing time

Weighting and scaling

Would have preferred scaled multiplied objective

Final chosen objective function

# Results & Discussion

Compare different diet types

Compare different objectives and satisfiability

Final output menu

Final output shopping list

Compare emissions to ones shown in data

Show that the menu is not reliant on aircraft deliveries

# Conclusions

# Suggestions for Further Work

What can BAS do to improve the situation

Which objectives can be best improved

How to improve all objectives

Can all objectives be improved at once

Vitamin D

Ruminent meat

Survey people to find out what diets they would be willing to adopt

Take bits of that ^ for conclusion

# References

# Appendices

Links to work (GitHub, Trello)

Shopping list

Menu

Test outputs

## Appendix A –

## Appendix B –