ISYE 3133 Project Phase 2 Deliverable

Nathan Cung, Eashan Gandotra, and Malina Hy

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Notes

- The indices of animal, food type, and facility are the indices of the table in the provided data set - $i, j, k \forall i \in [1:3], j \in [1:20], k \in [1:9]$.

- The model requires that recommended food value be assigned to individual animals before the model is run - for example, child animals will be assigned the child food recommended intake, and adult animals will be assigned the adult food recommended intake, based on the adulthood age of the animal's species.

- We assume there are 90 days/3 months in one fiscal quarter.

- Assume the animals adopted are adults

- We are assuming that the large cat enclosure can hold up to 5 cats of one species?

Data / Parameters

$$c_{ij} = \text{cost per pound of food type } j \text{ for individual animal } i$$
$$w_{ij} = \text{welfare score for food type } j \text{ for individual animal } i$$
$$q_k = \text{estimated monthly attendance increase per 10,000 dollar investment in facility } k$$
$$r_i = \text{pounds of food required per day by individual animal } i$$

Variables

$$z_m = \text{The number of animals of species m adopted}$$
$$y_m = \begin{cases} 1, & \text{if } z_m > 0 \\ 0, & \text{otherwise} \end{cases}$$

Model

$$\max z = \sum_{i=1}^{20} \sum_{j=1}^{3} \frac{x_{i,j} w_{i,j}}{r_i}$$

s.t.

$$a_k \leq 20,000 \forall i$$

$$200000 + \sum_{k=1}^{9} \frac{3(10)(q_k)(a_k)}{10000} \geq 1.05 \left(100000 + \sum_{k=1}^{9} a_k + \sum_{i=1}^{20} \sum_{j=1}^{3} \frac{90(x_{ij})(c_{ij})}{10} \right)$$

$$\sum_{j=1}^{3} x_{ij} = r_i \forall i$$

$$\sum_{m=1}^{14} z_m \geq 5$$

$$z_m \leq 5 \forall m$$

$$y_5 + y_6 + y_7 + y_{10} \leq 1$$

$$y_1 + y_4 + y_{12} + y_{13} + y_{14} \leq 1$$

$$y_2 + y_3 + y_5 + y_6 + y_7 + y_8 + y_9 + y_{10} + y_{11} \leq 3$$

$$x_{ij}, a_k, z_m \geq 0 \forall i, j, k, m$$

$$y = 0 \text{ or } 1$$