

Supplementary Material:

Hyperspectral Reflectance Indices

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For the following hyperspectral reflectance indices, we have made the following identifications:

$$\begin{aligned} R_b &= R(440 \text{ nm}) \\ R_g &= R(550 \text{ nm}) \\ R_r &= R(650 \text{ nm}) \\ R_{nir} &= R(860 \text{ nm}). \end{aligned} \tag{1}$$

We also define $R_{swir} = R(1009 \text{ nm})$ as the *almost*-SWIR band representing the infrared edge of the hyperspectral imager.

Table 1: Spectral indices supplied as extra features to each ML model. For each index, R_λ denotes the reflectance at wavelength λ used to compute the index. R_b , R_g , etc are defined in Equation 1.

| Spectral Index | Acronym | Formula |
|---------------------------------------|---------|---|
| Difference Vegetation Index | DVI | $\frac{2.5(R_{nir} - R_r)}{R_{nir} + 6R_r - 7.5R_b + 1}$ |
| Global Environmental Monitoring Index | GEMI* | $\text{eta}(1 - 0.25 \text{ eta}) - \frac{R_r - 1.125}{1 - R_r}$ |
| Green Atmospherically Resistant Index | GARI** | $\frac{R_{nir} - (R_g - \gamma(R_b - R_r))}{R_{nir} + (R_g - \gamma(R_b - R_r))}$ |
| Green Chlorophyll Index | GCI | $\frac{R_{nir}}{R_g} - 1$ |
| Green Difference Vegetation Index | GDVI | $\frac{R_{nir} - R_g}{(R_g - R_r) + (R_g - R_b)}$ |
| Green Leaf Index | GLI | $\frac{(R_g - R_r) + (R_g - R_b)}{2R_g + R_r + R_b}$ |

| Spectral Index | Acronym | Formula |
|--|---------|---|
| Green Normalized Difference Vegetation Index | GNDVI | $\frac{R_{nir} - R_g}{R_{nir} + R_g}$ |
| Green Optimized Soil Adjusted Vegetation Index | GOSAVI | $\frac{R_{nir} - R_g}{R_{nir} + R_g + 0.16}$ |
| Green Ratio Vegetation Index | GRVI | $\frac{R_{nir}}{R_g}$ |
| Green Soil Adjusted Vegetation Index | GSAVI | $\frac{1.5(R_{nir} - R_g)}{R_{nir} + R_g + 0.5}$ |
| Infrared Percentage Vegetation Index | IPVI | $\frac{R_{nir}}{R_{nir} + R_r}$ |
| Leaf Area Index | LAI | $3.618 \left(\frac{2.5(R_{nir} - R_r)}{R_{nir} + 6R_r - 7.5R_b + 1} \right) - 0.118$ |
| Modified Non-Linear Index | MNLI | $\frac{1.5(R_{nir}^2 - R_r)}{R_{nir}^2 + R_r + 0.5}$ |
| Modified Soil Adjusted Vegetation Index 2 | MSAVI2 | $\frac{2R_{nir} + 1 - \sqrt{(2R_{nir} + 1)^2 - 8(R_{nir} - R_r)}}{2}$ |
| Modified Simple Ratio | MSR | $\frac{R_{nir}/R_r - 1}{\sqrt{R_{nir}/R_r} + 1}$ |
| Non-Linear Index | NLI | $\frac{R_{nir}^2 - R_r}{R_{nir}^2 + R_r}$ |
| Normalized Difference Vegetation Index | NDVI | $\frac{R_{nir} - R_r}{R_{nir} + R_r}$ |
| Normalized Pigment Chlorophyll Index | NPCI | $\frac{R_{680} - R_{430}}{R_{680} + R_{430}}$ |
| Optimized Soil Adjusted Vegetation Index | OSAVI | $\frac{R_{nir} - R_r}{R_{nir} + R_r + 0.16}$ |
| Renormalized Difference Vegetation Index | RDVI | $\frac{R_{nir} - R_r}{\sqrt{R_{nir} + R_r}}$ |
| Soil Adjusted Vegetation Index | SAVI | $\frac{1.5(R_{nir} - R_r)}{R_{nir} + R_r + 0.5}$ |
| Simple Ratio | SR | $\frac{R_{nir}}{R_r}$ |
| Transformed Difference Vegetation Index | TDVI | $\frac{1.5R_{nir} - R_r}{\sqrt{R_{nir}^2 + R_r + 0.5}}$ |
| Triangular Greenness Index | TGI | $\frac{(\lambda_r - \lambda_b)(R_r - R_g) - (\lambda_r - \lambda_g)(R_r - R_b)}{2}$ |

| Spectral Index | Acronym | Formula |
|--|---------|---|
| Visible Atmospherically Resistant Index | VARI | $\frac{R_g - R_r}{R_g + R_r - R_b}$ |
| Wide Dynamic Range Vegetation Index | WDRVI | $\frac{0.2R_{nir} - R_r}{0.2 * R_{nir} + R_r}$ |
| Atmospherically Resistant Vegetation Index | ARVI | $\frac{R_{800} - (R_{800} - 1(R_{450} - R_{680}))}{R_{800} + (R_{680} - 1(R_{450} - R_{680}))}$ |
| Modified Chlorophyll Absorption Ratio Index | MCARI | $((R_{700} - R_{670}) - 2(R_{700} - R_{550})) \frac{R_{700}}{R_{670}}$ |
| Modified Chlorophyll Absorption Ratio Index Improved | MCARI2 | $\frac{1.5(2.5(R_{800} - R_{670}) - 1.3(R_{800} - R_{550}))}{\sqrt{(2R_{800} + 1)^2 - (6R_{800} - 5\sqrt{R_{670}}) - 0.5}}$ |
| Modified Red Edge Normalized Difference Vegetation Index | MRENDVI | $\frac{R_{750} - R_{705}}{R_{750} + R_{705} - 2R_{445}}$ |
| Modified Red Edge Simple Ratio | MRESR | $\frac{R_{750} - R_{445}}{R_{705} - R_{445}}$ |
| Modified Triangular Vegetation Index | MTVI | $1.2(1.2(R_{800} - R_{550}) - 2.5(R_{670} - R_{550}))$ |
| Red Edge Normalized Difference Vegetation Index | RENDVI | $\frac{R_{750} - R_{705}}{R_{750} + R_{705}}$ |
| Transformed Chlorophyll Absorption Reflectance Index | TCARI | $3 \left((R_{700} - R_{670}) - 0.2(R_{700} - R_{550}) \frac{R_{700}}{R_{670}} \right)$ |
| Triangular Vegetation Index | TVI | $0.5(120(R_{750} - R_{550}) - 200(R_{670} - R_{550}))$ |
| Vogelmann Red Edge Index 1 | VREI1 | $\frac{R_{740}}{R_{720}}$ |
| Vogelmann Red Edge Index 2 | VREI2 | $\frac{R_{734} - R_{747}}{R_{715} + R_{726}}$ |
| Vogelmann Red Edge Index 3 | VREI3 | $\frac{R_{734} - R_{747}}{R_{715} + R_{720}}$ |
| Photochemical Reflectance Index | PRI | $\frac{R_{531} - R_{570}}{R_{531} + R_{570}}$ |
| Structure Insensitive Pigment Index | SIPI | $\frac{R_{800} - R_{445}}{R_{800} + R_{680}}$ |
| Structure Independent Pigment Index | SIPI1 | $\frac{R_{445} - R_{800}}{R_{670} - R_{800}}$ |
| Plant Senescence Reflectance Index | PSRI | $\frac{R_{680} - R_{500}}{R_{750}}$ |
| Anthocyanin Reflectance Index 1 | ARI1 | $\frac{1}{R_{550}} - \frac{1}{R_{700}}$ |

| Spectral Index | Acronym | Formula |
|--|---------|---|
| Anthocyanin Reflectance Index 2 | ARI2 | $\left(\frac{1}{R_{550}} - \frac{1}{R_{700}} \right) R_{800}$ |
| Carotenoid Reflectance Index 1 | CRI1 | $\frac{1}{\frac{R_{510}}{1} - \frac{R_{550}}{1}}$ |
| Carotenoid Reflectance Index 2 | CRI2 | $\frac{1}{\frac{R_{510}}{R_g - R_{nir}} - \frac{R_{700}}{R_g + R_{nir}}}$ |
| Normalized Difference Water Index 1 | NDWI1 | $\frac{R_{nir} - R_{swir}}{R_{nir} + R_{swir}}$ |
| Normalized Difference Water Index 2 | NDWI2 | $\frac{R_g - R_{swir}}{R_g + R_{swir}}$ |
| Modified Normalized Difference Water Index | MNDWI | $\frac{970}{900} \frac{R_g}{R_{nir}}$ |
| Water Band Index | WBI | $\frac{R_{nir}}{R_{705}} - 1$ |
| Anthocyanin Content Index | ACI | $\left(\frac{1}{R_{550}} - \frac{1}{R_{700}} \right) R_{nir}$ |
| Chlorophyll Index Red Edge | CIre | $\frac{R_{swir}}{R_{nir}}$ |
| Modified Anthocyanin Reflectance Index | MARI | $\frac{R_{753.75} - R_{708.75}}{R_{708.75} - R_{681.25}}$ |
| Moisture Stress Index | MSI | $\frac{R_{nir} - R_{swir}}{R_{nir} + R_{swir}}$ |
| MERIS Terrestrial Chlorophyll Index | MTCI | $\frac{R_{790} - R_{720}}{R_{790} + R_{720}}$ |
| Normalzied Difference Infrared Index | NDII | $\frac{R_r}{R_g}$ |
| Normalized Difference Red Edge | NDRE | $\frac{R_{714} + R_{752}}{2} - R_{733}$ |
| Red Green Ratio Index | RGRI | |
| Red Edge Vegetation Stress Index | RVSI | |