pokemon dataset

sarah branch

```r
library(ggplot2)
library(dplyr)
```

```
Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union
```

```r
library(mltools)
library(data.table)
```

```
Attaching package: 'data.table'

The following objects are masked from 'package:dplyr':

    between, first, last
```

```r
pokemon <- read.csv("/Users/sarah/Desktop/SDS291/FinalProject/pokemon.csv")
```

```r
unique(pokemon$'classfication') #typo in official colum name and should change
```

```
 [1] "Seed Pokémon"
 [2] "Lizard Pokémon"
 [3] "Flame Pokémon"
 [4] "Tiny Turtle Pokémon"
 [5] "Turtle Pokémon"
 [6] "Shellfish Pokémon"
 [7] "Worm Pokémon"
 [8] "Cocoon Pokémon"
 [9] "Butterfly Pokémon"
[10] "Hairy Pokémon"
[11] "Poison Bee Pokémon"
[12] "Tiny Bird Pokémon"
[13] "Bird Pokémon"
[14] "Mouse Pokémon"
[15] "Beak Pokémon"
[16] "Snake Pokémon"
[17] "Cobra Pokémon"
[18] "Poison Pin Pokémon"
[19] "Drill Pokémon"
[20] "Fairy Pokémon"
[21] "Fox Pokémon"
[22] "Balloon Pokémon"
[23] "Bat Pokémon"
[24] "Weed Pokémon"
[25] "Flower Pokémon"
[26] "Mushroom Pokémon"
[27] "Insect Pokémon"
[28] "Poison Moth Pokémon"
[29] "Mole Pokémon"
[30] "Scratch Cat Pokémon"
[31] "Classy Cat Pokémon"
[32] "Duck Pokémon"
[33] "Pig Monkey Pokémon"
[34] "Puppy Pokémon"
[35] "Legendary Pokémon"
[36] "Tadpole Pokémon"
[37] "Psi Pokémon"
[38] "Superpower Pokémon"
[39] "Flycatcher Pokémon"
[40] "Jellyfish Pokémon"
```

```
[41] "Rock Pokémon"
[42] "Megaton Pokémon"
[43] "Fire Horse Pokémon"
[44] "Dopey Pokémon"
[45] "Hermit Crab Pokémon"
[46] "Magnet Pokémon"
[47] "Wild Duck Pokémon"
[48] "Twin Bird Pokémon"
[49] "Triple Bird Pokémon"
[50] "Sea Lion Pokémon"
[51] "Sludge Pokémon"
[52] "Bivalve Pokémon"
[53] "Gas Pokémon"
[54] "Shadow Pokémon"
[55] "Rock Snake Pokémon"
[56] "Hypnosis Pokémon"
[57] "River Crab Pokémon"
[58] "Pincer Pokémon"
[59] "Ball Pokémon"
[60] "Egg Pokémon"
[61] "Coconut Pokémon"
[62] "Lonely Pokémon"
[63] "Bone Keeper Pokémon"
[64] "Kicking Pokémon"
[65] "Punching Pokémon"
[66] "Licking Pokémon"
[67] "Poison Gas Pokémon"
[68] "Spikes Pokémon"
[69] "Vine Pokémon"
[70] "Parent Pokémon"
[71] "Dragon Pokémon"
[72] "Goldfish Pokémon"
[73] "Starshape Pokémon"
[74] "Mysterious Pokémon"
[75] "Barrier Pokémon"
[76] "Mantis Pokémon"
[77] "Humanshape Pokémon"
[78] "Electric Pokémon"
[79] "Spitfire Pokémon"
[80] "Stagbeetle Pokémon"
[81] "Wild Bull Pokémon"
[82] "Fish Pokémon"
[83] "Atrocious Pokémon"
```

```
 [84] "Transport Pokémon"
 [85] "Transform Pokémon"
 [86] "Evolution Pokémon"
 [87] "Bubble Jet Pokémon"
 [88] "Lightning Pokémon"
 [89] "Virtual Pokémon"
 [90] "Spiral Pokémon"
 [91] "Fossil Pokémon"
 [92] "Sleeping Pokémon"
 [93] "Freeze Pokémon"
 [94] "Genetic Pokémon"
 [95] "New Species Pokémon"
 [96] "Leaf Pokémon"
 [97] "Herb Pokémon"
 [98] "Fire Mouse Pokémon"
 [99] "Volcano Pokémon"
[100] "Big Jaw Pokémon"
[101] "Scout Pokémon"
[102] "Long Body Pokémon"
[103] "Owl Pokémon"
[104] "Five Star Pokémon"
[105] "String Spit Pokémon"
[106] "Long Leg Pokémon"
[107] "Angler Pokémon"
[108] "Light Pokémon"
[109] "Tiny Mouse Pokémon"
[110] "Star Shape Pokémon"
[111] "Spike Ball Pokémon"
[112] "Happiness Pokémon"
[113] "Little Bird Pokémon"
[114] "Mystic Pokémon"
[115] "Wool Pokémon"
[116] "Aquamouse Pokémon"
[117] "Aquarabbit Pokémon"
[118] "Imitation Pokémon"
[119] "Frog Pokémon"
[120] "Cottonweed Pokémon"
[121] "Long Tail Pokémon"
[122] "Sun Pokémon"
[123] "Clear Wing Pokémon"
[124] "Water Fish Pokémon"
[125] "Moonlight Pokémon"
[126] "Darkness Pokémon"
```

```
[127] "Royal Pokémon"
[128] "Screech Pokémon"
[129] "Symbol Pokémon"
[130] "Patient Pokémon"
[131] "Long Neck Pokémon"
[132] "Bagworm Pokémon"
[133] "Land Snake Pokémon"
[134] "Flyscorpion Pokémon"
[135] "Iron Snake Pokémon"
[136] "Mold Pokémon"
[137] "Singlehorn Pokémon"
[138] "Sharp Claw Pokémon"
[139] "Little Bear Pokémon"
[140] "Hibernator Pokémon"
[141] "Lava Pokémon"
[142] "Pig Pokémon"
[143] "Swine Pokémon"
[144] "Coral Pokémon"
[145] "Jet Pokémon"
[146] "Delivery Pokémon"
[147] "Kite Pokémon"
[148] "Armor Bird Pokémon"
[149] "Dark Pokémon"
[150] "Long Nose Pokémon"
[151] "Armor Pokémon"
[152] "Big Horn Pokémon"
[153] "Painter Pokémon"
[154] "Scuffle Pokémon"
[155] "Handstand Pokémon"
[156] "Kiss Pokémon"
[157] "Live Coal Pokémon"
[158] "Milk Cow Pokémon"
[159] "Thunder Pokémon"
[160] "Aurora Pokémon"
[161] "Rock Skin Pokémon"
[162] "Hard Shell Pokémon"
[163] "Diving Pokémon"
[164] "Rainbow Pokémon"
[165] "Time Travel Pokémon"
[166] "Wood Gecko Pokémon"
[167] "Forest Pokémon"
[168] "Chick Pokémon"
[169] "Young Fowl Pokémon"
```

[170] "Blaze Pokémon"
[171] "Mud Fish Pokémon"
[172] "Bite Pokémon"
[173] "Tiny Racoon Pokémon"
[174] "Rush Pokémon"
[175] "Water Weed Pokémon"
[176] "Jolly Pokémon"
[177] "Carefree Pokémon"
[178] "Acorn Pokémon"
[179] "Wily Pokémon"
[180] "Wickid Pokémon"
[181] "TinySwallow Pokémon"
[182] "Swallow Pokémon"
[183] "Seagull Pokémon"
[184] "Water Bird Pokémon"
[185] "Feeling Pokémon"
[186] "Emotion Pokémon"
[187] "Embrace Pokémon"
[188] "Pond Skater Pokémon"
[189] "Eyeball Pokémon"
[190] "Slacker Pokémon"
[191] "Wild Monkey Pokémon"
[192] "Lazy Pokémon"
[193] "Trainee Pokémon"
[194] "Ninja Pokémon"
[195] "Shed Pokémon"
[196] "Whisper Pokémon"
[197] "Big Voice Pokémon"
[198] "Loud Noise Pokémon"
[199] "Guts Pokémon"
[200] "Arm Thrust Pokémon"
[201] "Polka Dot Pokémon"
[202] "Compass Pokémon"
[203] "Kitten Pokémon"
[204] "Prim Pokémon"
[205] "Deceiver Pokémon"
[206] "Iron Armor Pokémon"
[207] "Meditate Pokémon"
[208] "Discharge Pokémon"
[209] "Cheering Pokémon"
[210] "Firefly Pokémon"
[211] "Thorn Pokémon"
[212] "Stomach Pokémon"

[213] "Poison Bag Pokémon"
[214] "Savage Pokémon"
[215] "Brutal Pokémon"
[216] "Ball Whale Pokémon"
[217] "Float Whale Pokémon"
[218] "Numb Pokémon"
[219] "Eruption Pokémon"
[220] "Coal Pokémon"
[221] "Bounce Pokémon"
[222] "Manipulate Pokémon"
[223] "Spot Panda Pokémon"
[224] "Ant Pit Pokémon"
[225] "Vibration Pokémon"
[226] "Cactus Pokémon"
[227] "Scarecrow Pokémon"
[228] "Cotton Bird Pokémon"
[229] "Humming Pokémon"
[230] "Cat Ferret Pokémon"
[231] "Fang Snake Pokémon"
[232] "Meteorite Pokémon"
[233] "Whiskers Pokémon"
[234] "Ruffian Pokémon"
[235] "Rogue Pokémon"
[236] "Clay Doll Pokémon"
[237] "Sea Lily Pokémon"
[238] "Barnacle Pokémon"
[239] "Old Shrimp Pokémon"
[240] "Plate Pokémon"
[241] "Tender Pokémon"
[242] "Weather Pokémon"
[243] "Color Swap Pokémon"
[244] "Puppet Pokémon"
[245] "Marionette Pokémon"
[246] "Requiem Pokémon"
[247] "Beckon Pokémon"
[248] "Fruit Pokémon"
[249] "Wind Chime Pokémon"
[250] "Disaster Pokémon"
[251] "Bright Pokémon"
[252] "Snow Hat Pokémon"
[253] "Face Pokémon"
[254] "Clap Pokémon"
[255] "Ball Roll Pokémon"

```
[256] "Ice Break Pokémon"
[257] "Deep Sea Pokémon"
[258] "South Sea Pokémon"
[259] "Longevity Pokémon"
[260] "Rendezvous Pokémon"
[261] "Rock Head Pokémon"
[262] "Endurance Pokémon"
[263] "Iron Ball Pokémon"
[264] "Iron Claw Pokémon"
[265] "Iron Leg Pokémon"
[266] "Rock Peak Pokémon"
[267] "Iceberg Pokémon"
[268] "Iron Pokémon"
[269] "Eon Pokémon"
[270] "Sea Basin Pokémon"
[271] "Continent Pokémon"
[272] "Sky High Pokémon"
[273] "Wish Pokémon"
[274] "DNA Pokémon"
[275] "Tiny Leaf Pokémon"
[276] "Grove Pokémon"
[277] "Chimp Pokémon"
[278] "Playful Pokémon"
[279] "Penguin Pokémon"
[280] "Emperor Pokémon"
[281] "Starling Pokémon"
[282] "Predator Pokémon"
[283] "Plump Mouse Pokémon"
[284] "Beaver Pokémon"
[285] "Cricket Pokémon"
[286] "Flash Pokémon"
[287] "Spark Pokémon"
[288] "Gleam Eyes Pokémon"
[289] "Bud Pokémon"
[290] "Bouquet Pokémon"
[291] "Head Butt Pokémon"
[292] "Shield Pokémon"
[293] "Moth Pokémon"
[294] "Tiny Bee Pokémon"
[295] "Beehive Pokémon"
[296] "EleSquirrel Pokémon"
[297] "Sea Weasel Pokémon"
[298] "Cherry Pokémon"
```

```
[299] "Blossom Pokémon"
[300] "Sea Slug Pokémon"
[301] "Blimp Pokémon"
[302] "Rabbit Pokémon"
[303] "Magical Pokémon"
[304] "Big Boss Pokémon"
[305] "Catty Pokémon"
[306] "Tiger Cat Pokémon"
[307] "Bell Pokémon"
[308] "Skunk Pokémon"
[309] "Bronze Pokémon"
[310] "Bronze Bell Pokémon"
[311] "Bonsai Pokémon"
[312] "Mime Pokémon"
[313] "Playhouse Pokémon"
[314] "Music Note Pokémon"
[315] "Forbidden Pokémon"
[316] "Land Shark Pokémon"
[317] "Cave Pokémon"
[318] "Mach Pokémon"
[319] "Big Eater Pokémon"
[320] "Emanation Pokémon"
[321] "Aura Pokémon"
[322] "Hippo Pokémon"
[323] "Heavyweight Pokémon"
[324] "Scorpion Pokémon"
[325] "Ogre Scorp Pokémon"
[326] "Toxic Mouth Pokémon"
[327] "Bug Catcher Pokémon"
[328] "Wing Fish Pokémon"
[329] "Neon Pokémon"
[330] "Frosted Tree Pokémon"
[331] "Magnet Area Pokémon"
[332] "Thunderbolt Pokémon"
[333] "Blast Pokémon"
[334] "Jubilee Pokémon"
[335] "Ogre Darner Pokémon"
[336] "Verdant Pokémon"
[337] "Fresh Snow Pokémon"
[338] "Fang Scorp Pokémon"
[339] "Twin Tusk Pokémon"
[340] "Blade Pokémon"
[341] "Gripper Pokémon"
```

```
[342] "Snow Land Pokémon"
[343] "Plasma Pokémon"
[344] "Knowledge Pokémon"
[345] "Willpower Pokémon"
[346] "Temporal Pokémon"
[347] "Spatial Pokémon"
[348] "Lava Dome Pokémon"
[349] "Colossal Pokémon"
[350] "Renegade Pokémon"
[351] "Lunar Pokémon"
[352] "Sea Drifter Pokémon"
[353] "Seafaring Pokémon"
[354] "Pitch-Black Pokémon"
[355] "Gratitude Pokémon"
[356] "Alpha Pokémon"
[357] "Victory Pokémon"
[358] "Grass Snake Pokémon"
[359] "Regal Pokémon"
[360] "Fire Pig Pokémon"
[361] "Mega Fire Pig Pokémon"
[362] "Sea Otter Pokémon"
[363] "Discipline Pokémon"
[364] "Formidable Pokémon"
[365] "Lookout Pokémon"
[366] "Loyal Dog Pokémon"
[367] "Big-Hearted Pokémon"
[368] "Devious Pokémon"
[369] "Cruel Pokémon"
[370] "Grass Monkey Pokémon"
[371] "Thorn Monkey Pokémon"
[372] "High Temp Pokémon"
[373] "Ember Pokémon"
[374] "Spray Pokémon"
[375] "Geyser Pokémon"
[376] "Dream Eater Pokémon"
[377] "Drowsing Pokémon"
[378] "Tiny Pigeon Pokémon"
[379] "Wild Pigeon Pokémon"
[380] "Proud Pokémon"
[381] "Electrified Pokémon"
[382] "Mantle Pokémon"
[383] "Ore Pokémon"
[384] "Compressed Pokémon"
```

[385] "Courting Pokémon"
[386] "Subterrene Pokémon"
[387] "Hearing Pokémon"
[388] "Muscular Pokémon"
[389] "Judo Pokémon"
[390] "Karate Pokémon"
[391] "Sewing Pokémon"
[392] "Leaf-Wrapped Pokémon"
[393] "Nurturing Pokémon"
[394] "Centipede Pokémon"
[395] "Curlipede Pokémon"
[396] "Megapede Pokémon"
[397] "Cotton Puff Pokémon"
[398] "Windveiled Pokémon"
[399] "Bulb Pokémon"
[400] "Flowering Pokémon"
[401] "Hostile Pokémon"
[402] "Desert Croc Pokémon"
[403] "Intimidation Pokémon"
[404] "Zen Charm Pokémon"
[405] "Blazing Pokémon"
[406] "Rock Inn Pokémon"
[407] "Stone Home Pokémon"
[408] "Shedding Pokémon"
[409] "Hoodlum Pokémon"
[410] "Avianoid Pokémon"
[411] "Spirit Pokémon"
[412] "Coffin Pokémon"
[413] "Prototurtle Pokémon"
[414] "First Bird Pokémon"
[415] "Trash Bag Pokémon"
[416] "Trash Heap Pokémon"
[417] "Tricky Fox Pokémon"
[418] "Illusion Fox Pokémon"
[419] "Chinchilla Pokémon"
[420] "Scarf Pokémon"
[421] "Fixation Pokémon"
[422] "Astral Body Pokémon"
[423] "Cell Pokémon"
[424] "Mitosis Pokémon"
[425] "Multiplying Pokémon"
[426] "White Bird Pokémon"
[427] "Icy Snow Pokémon"

[428] "Snowstorm Pokémon"
[429] "Season Pokémon"
[430] "Sky Squirrel Pokémon"
[431] "Clamping Pokémon"
[432] "Cavalry Pokémon"
[433] "Floating Pokémon"
[434] "Caring Pokémon"
[435] "Attaching Pokémon"
[436] "EleSpider Pokémon"
[437] "Thorn Seed Pokémon"
[438] "Thorn Pod Pokémon"
[439] "Gear Pokémon"
[440] "EleFish Pokémon"
[441] "Cerebral Pokémon"
[442] "Candle Pokémon"
[443] "Lamp Pokémon"
[444] "Luring Pokémon"
[445] "Tusk Pokémon"
[446] "Axe Jaw Pokémon"
[447] "Chill Pokémon"
[448] "Freezing Pokémon"
[449] "Crystallizing Pokémon"
[450] "Snail Pokémon"
[451] "Shell Out Pokémon"
[452] "Trap Pokémon"
[453] "Martial Arts Pokémon"
[454] "Automaton Pokémon"
[455] "Sharp Blade Pokémon"
[456] "Sword Blade Pokémon"
[457] "Bash Buffalo Pokémon"
[458] "Eaglet Pokémon"
[459] "Valiant Pokémon"
[460] "Diapered Pokémon"
[461] "Bone Vulture Pokémon"
[462] "Anteater Pokémon"
[463] "Iron Ant Pokémon"
[464] "Irate Pokémon"
[465] "Torch Pokémon"
[466] "Iron Will Pokémon"
[467] "Cavern Pokémon"
[468] "Grassland Pokémon"
[469] "Cyclone Pokémon"
[470] "Bolt Strike Pokémon"

```
[471] "Vast White Pokémon"
[472] "Deep Black Pokémon"
[473] "Abundance Pokémon"
[474] "Boundary Pokémon"
[475] "Colt Pokémon"
[476] "Melody Pokémon"
[477] "Paleozoic Pokémon"
[478] "Spiky Nut Pokémon"
[479] "Spiny Armor Pokémon"
[480] "Bubble Frog Pokémon"
[481] "Digging Pokémon"
[482] "Tiny Robin Pokémon"
[483] "Scorching Pokémon"
[484] "Scatterdust Pokémon"
[485] "Scale Pokémon"
[486] "Lion Cub Pokémon"
[487] "Single Bloom Pokémon"
[488] "Garden Pokémon"
[489] "Mount Pokémon"
[490] "Daunting Pokémon"
[491] "Poodle Pokémon"
[492] "Restraint Pokémon"
[493] "Constraint Pokémon"
[494] "Sword Pokémon"
[495] "Royal Sword Pokémon"
[496] "Perfume Pokémon"
[497] "Fragrance Pokémon"
[498] "Cotton Candy Pokémon"
[499] "Meringue Pokémon"
[500] "Revolving Pokémon"
[501] "Overturning Pokémon"
[502] "Two-Handed Pokémon"
[503] "Collective Pokémon"
[504] "Mock Kelp Pokémon"
[505] "Water Gun Pokémon"
[506] "Howitzer Pokémon"
[507] "Generator Pokémon"
[508] "Royal Heir Pokémon"
[509] "Despot Pokémon"
[510] "Tundra Pokémon"
[511] "Intertwining Pokémon"
[512] "Wrestling Pokémon"
[513] "Antenna Pokémon"
```

[514] "Jewel Pokémon"
[515] "Soft Tissue Pokémon"
[516] "Key Ring Pokémon"
[517] "Stump Pokémon"
[518] "Elder Tree Pokémon"
[519] "Pumpkin Pokémon"
[520] "Ice Chunk Pokémon"
[521] "Sound Wave Pokémon"
[522] "Life Pokémon"
[523] "Destruction Pokémon"
[524] "Order Pokémon"
[525] "Mischief Pokémon (Confined)Djinn Pokémonn (Unbound)"
[526] "Steam Pokémon"
[527] "Grass Quill Pokémon"
[528] "Blade Quill Pokémon"
[529] "Arrow Quill Pokémon"
[530] "Fire Cat Pokémon"
[531] "Heel Pokémon"
[532] "Pop Star Pokémon"
[533] "Soloist Pokémon"
[534] "Woodpecker Pokémon"
[535] "Bugle Beak Pokémon"
[536] "Cannon Pokémon"
[537] "Loitering Pokémon"
[538] "Stakeout Pokémon"
[539] "Larva Pokémon"
[540] "Battery Pokémon"
[541] "Stag Beetle Pokémon"
[542] "Boxing Pokémon"
[543] "Woolly Crab Pokémon"
[544] "Dancing Pokémon"
[545] "Bee Fly Pokémon"
[546] "Wolf Pokémon"
[547] "Small Fry Pokémon"
[548] "Brutal Star Pokémon"
[549] "Donkey Pokémon"
[550] "Draft Horse Pokémon"
[551] "Water Bubble Pokémon"
[552] "Sickle Grass Pokémon"
[553] "Bloom Sickle Pokémon"
[554] "Illuminating Pokémon"
[555] "Toxic Lizard Pokémon"
[556] "Flailing Pokémon"

[557] "Strong Arm Pokémon"
[558] "Posy Picker Pokémon"
[559] "Sage Pokémon"
[560] "Teamwork Pokémon"
[561] "Turn Tail Pokémon"
[562] "Hard Scale Pokémon"
[563] "Sand Heap Pokémon"
[564] "Sand Castle Pokémon"
[565] "Sea Cucumber Pokémon"
[566] "Synthetic Pokémon"
[567] "Meteor Pokémon"
[568] "Blast Turtle Pokémon"
[569] "Roly-Poly Pokémon"
[570] "Disguise Pokémon"
[571] "Gnash Teeth Pokémon"
[572] "Placid Pokémon"
[573] "Sea Creeper Pokémon"
[574] "Scaly Pokémon"
[575] "Land Spirit Pokémon"
[576] "Nebula Pokémon"
[577] "Protostar Pokémon"
[578] "Sunne Pokémon"
[579] "Moone Pokémon"
[580] "Parasite Pokémon"
[581] "Swollen Pokémon"
[582] "Lissome Pokémon"
[583] "Glowing Pokémon"
[584] "Launch Pokémon"
[585] "Drawn Sword Pokémon"
[586] "Junkivore Pokémon"
[587] "Prism Pokémon"
[588] "Artificial Pokémon"

Possible Approach #1: Legendary Status

Possible Research Questions

- How will a pokemon's type1 and type2 to affect their legendary status?
- How will a pokemon's base stats affect a pokemon's legendary status?
- How does a pokemon's stats and type1 affect a pokemon's legendary status?

Making is_legendary categorical first

```r
pokemon$is_legendary <- factor(pokemon$is_legendary,
labels = c("Not Legendary", "Legendary")
)
```

How will a pokemon's base stats affect a pokemon's legendary status?

```r
ggplot(data = pokemon, mapping = aes(x = attack, y = is_legendary)) +
    geom_boxplot()
```
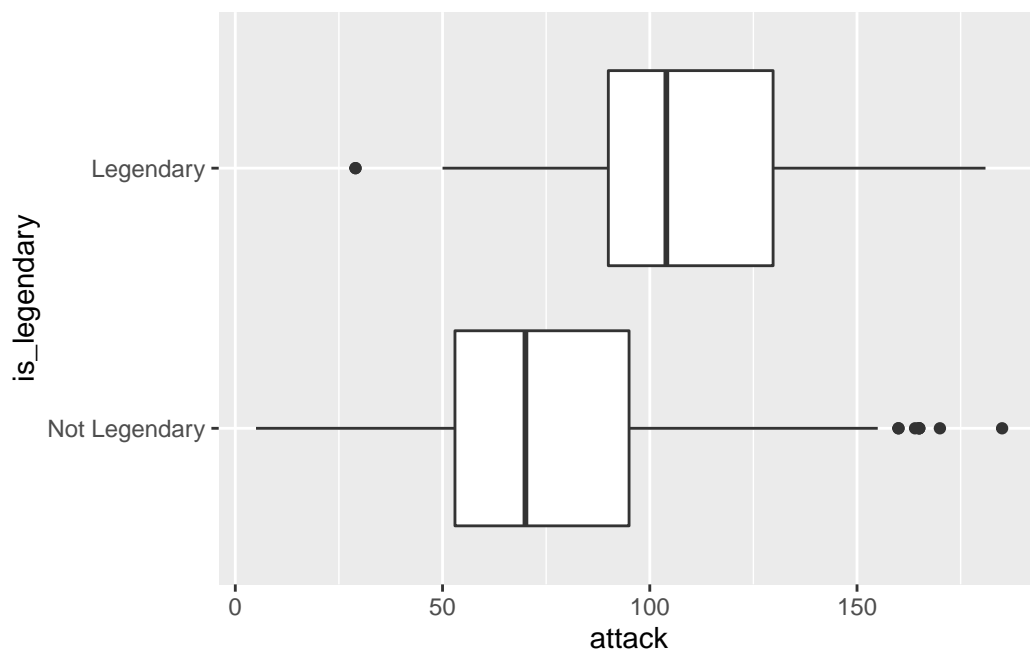


```r
ggplot(data = pokemon, mapping = aes(x = defense, y = is_legendary)) +
    geom_boxplot()
```
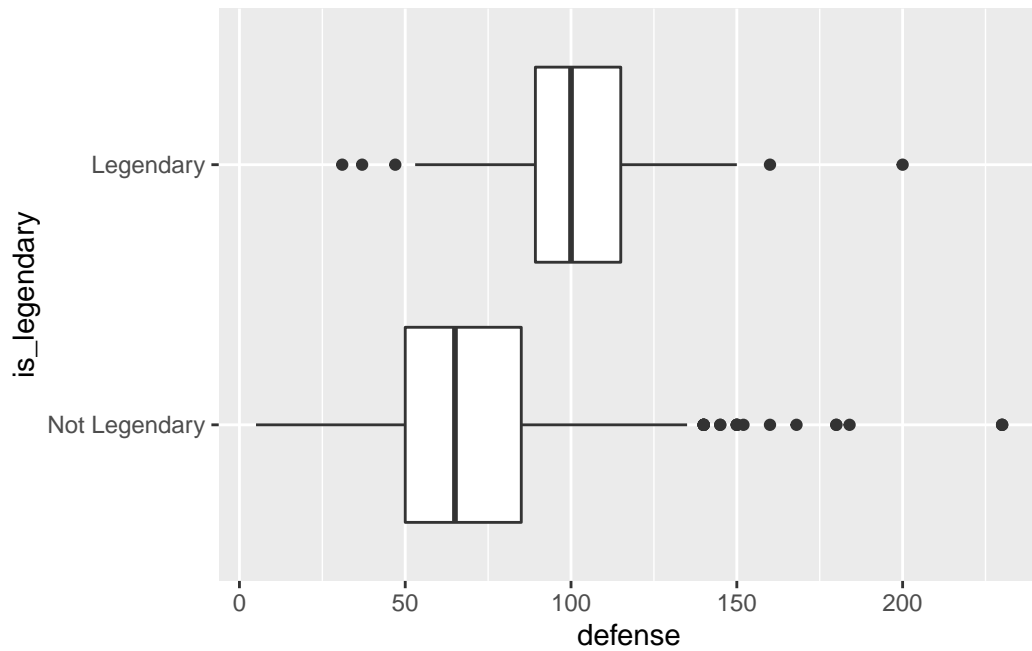
```
ggplot(data = pokemon, mapping = aes(x = hp, y = is_legendary)) +
    geom_boxplot()
```


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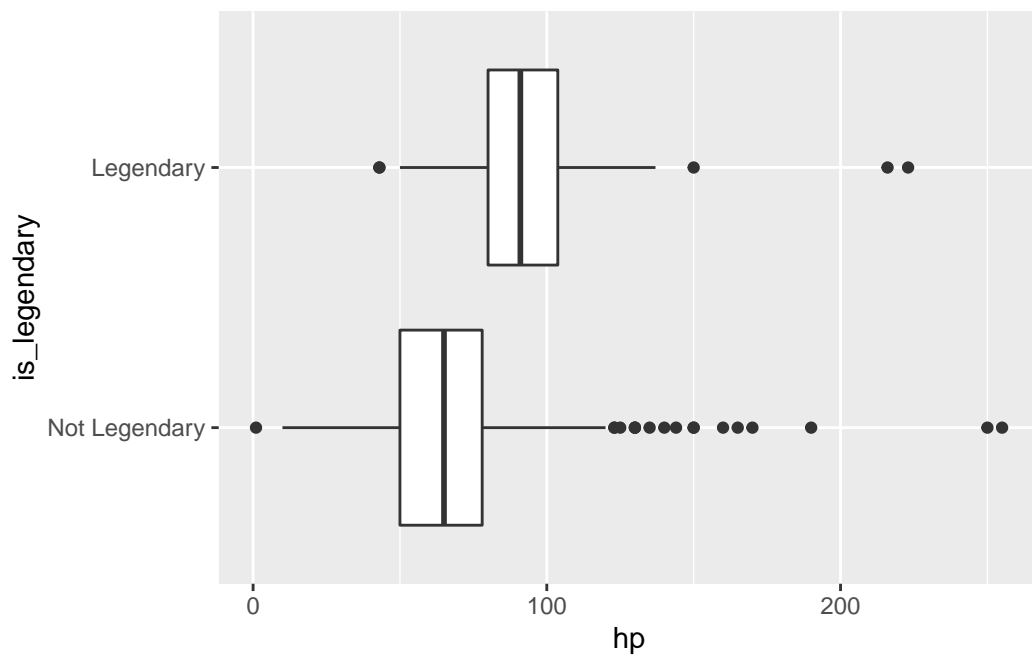
```r
ggplot(data = pokemon, mapping = aes(x = speed, y = is_legendary)) +
    geom_boxplot()
```
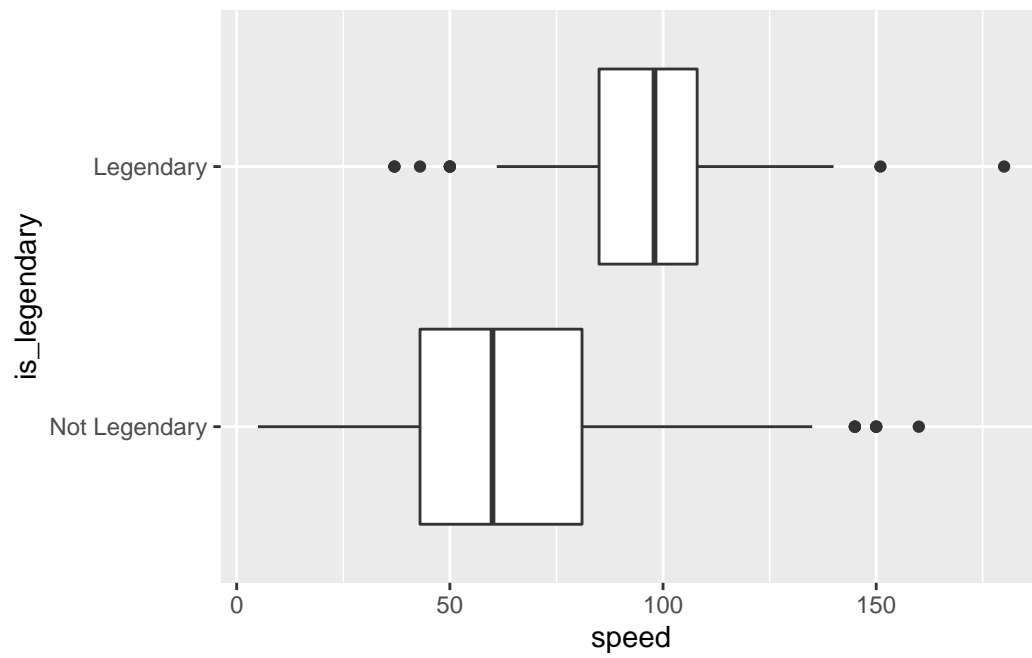

Making the models

Additive Model

Interactive Model

Nested F-test

How will a pokemon's type1 and type2 to affect their legendary status?

This bar plot is definetely wrong but idk how to fix it

```
ggplot(data = pokemon, mapping = aes(x = type1, y = is_legendary)) +
    geom_col()
```
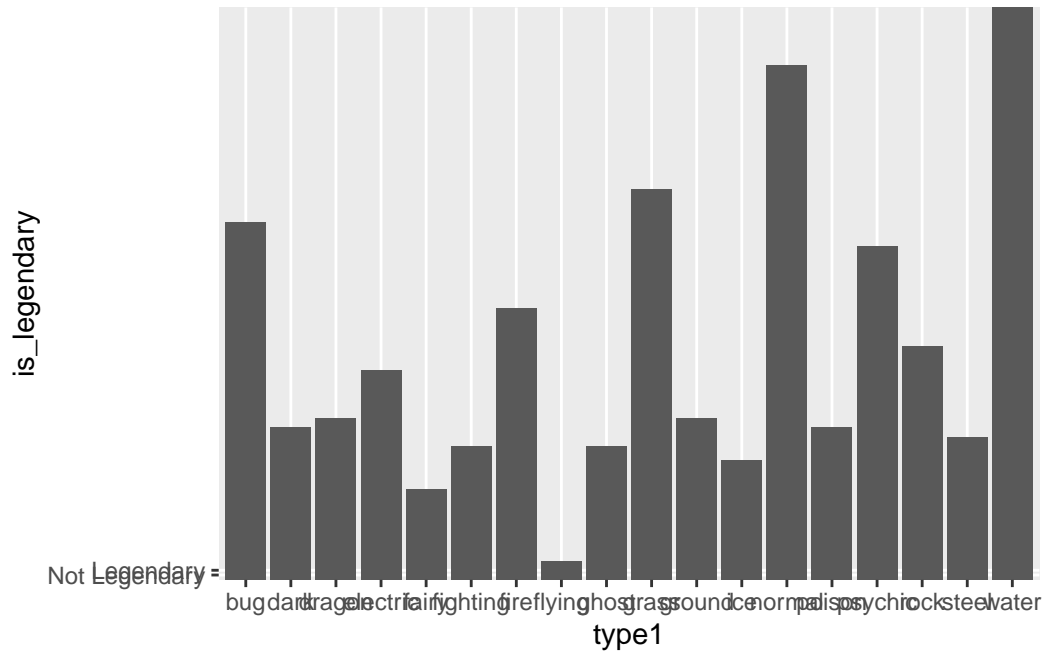


```
ggplot(data = pokemon, mapping = aes(x = type2, y = is_legendary)) +
    geom_col()
```
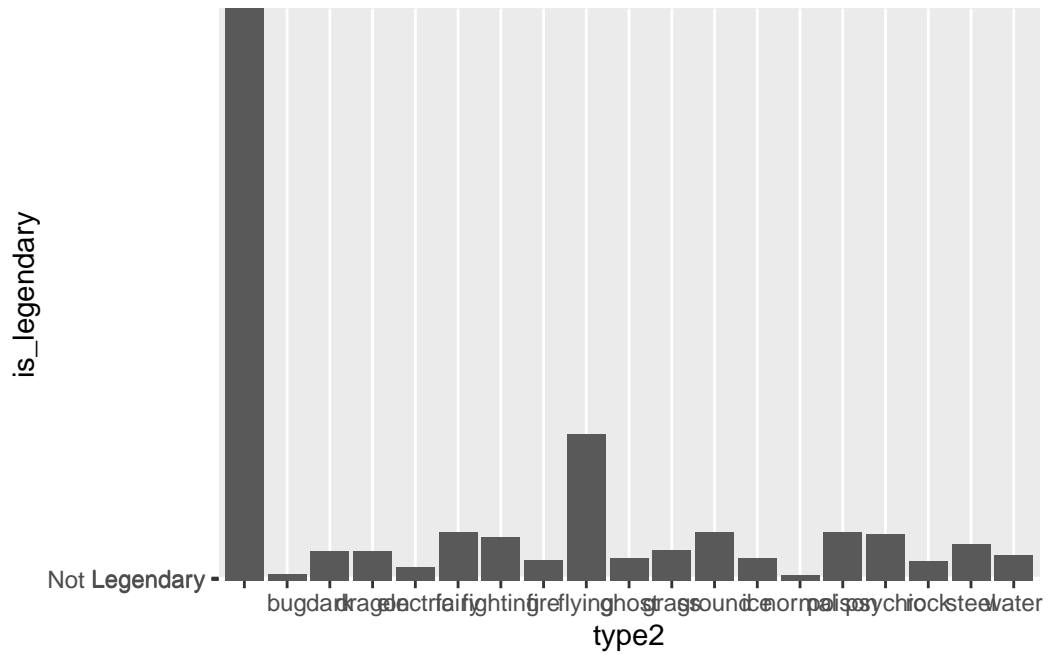
```
ggplot(data = pokemon, mapping = aes(x = type1, y = is_legendary, color=type2)) +
    geom_col()
```


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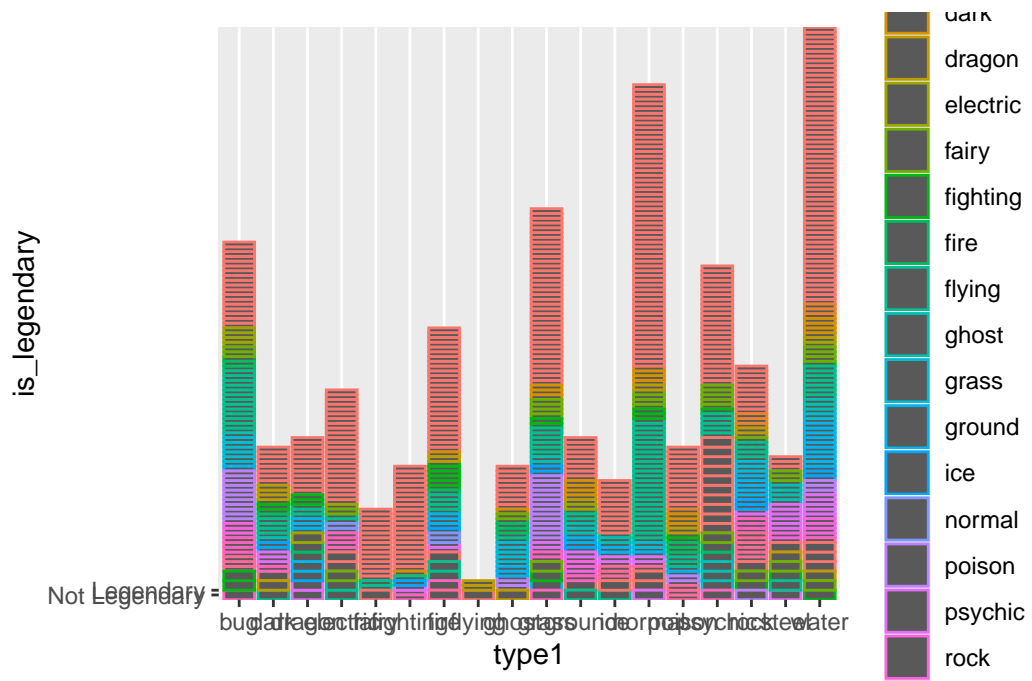
```
pokemon <- mutate(pokemon, duel_type = if_else(!is.na(type2) & !is.na(type2), "duel type",

pokemon <- mutate(pokemon, duel_type = !is.na(type1) & !is.na(type2))

# pokemon <- mutate(pokemon, duel_type = if_else(type2 = NA, TRUE, FALSE))

pokemon <- mutate(pokemon, duel_type = grepl(pattern = "", type2, ignore.case = TRUE))

pokemon <- mutate(pokemon, duel_type = grepl(pattern = NA, type2, ignore.case = TRUE))

unique(pokemon$'duel_type')
```

```
[1] NA
```

Making the model

Additive model

Interactive model

Nested F-test

How does a pokemon's stats and type1 affect a pokemon's legendary status?

Combined of the first two parts in a way.

Making the model

Additive model

Interactive model

Nested F-test

Possible Approach #2: Capture Rate

Possible Research Questions

- How do different pokemon's base stats influence capture rate?
- How do a pokemon's type 1 and type 2 affect capture rate?
- How do a pokemon's type 1, and base stats affect its capture rate?

How do a pokemon's type 1 and type 2 affect capture rate?

```
pokemon$'capture_rate' = as.numeric(pokemon$'capture_rate')
```

Warning: NAs introduced by coercion

```
pokemon$'type1' = as.factor(pokemon$'type1')
pokemon$'type2' = as.factor(pokemon$'type2')
```

Fix barplots since they are definetely wrong

```
ggplot(data = pokemon, mapping = aes(x = type1, y = capture_rate)) +
    geom_col()
```

Warning: Removed 1 rows containing missing values (position_stack).

```
ggplot(data = pokemon, mapping = aes(x = type2, y = capture_rate)) +
    geom_col()
```
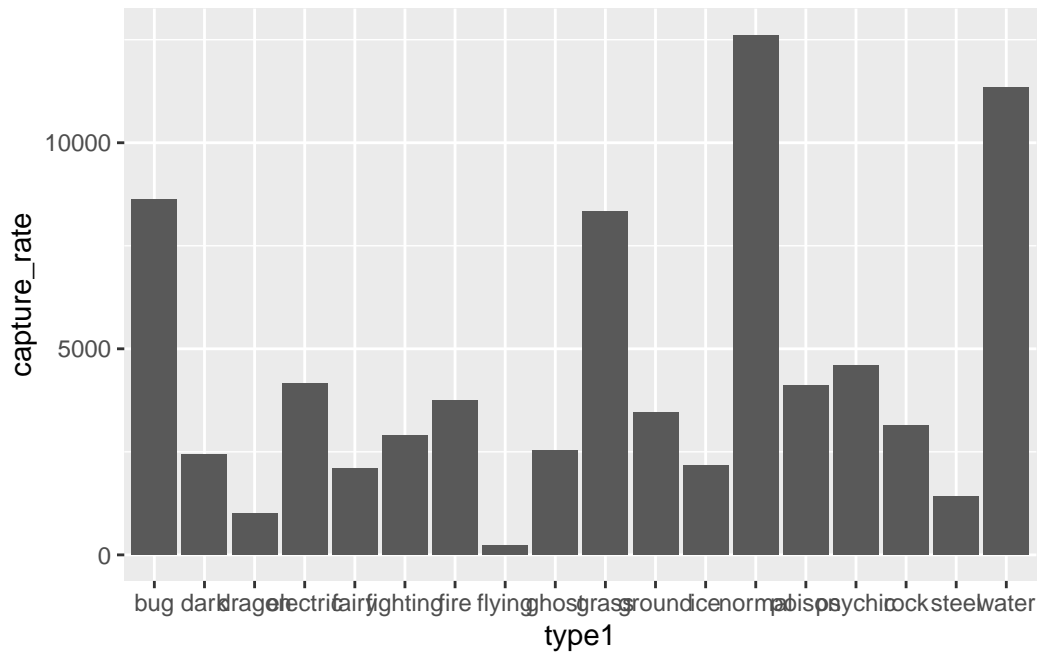
Warning: Removed 1 rows containing missing values (position_stack).
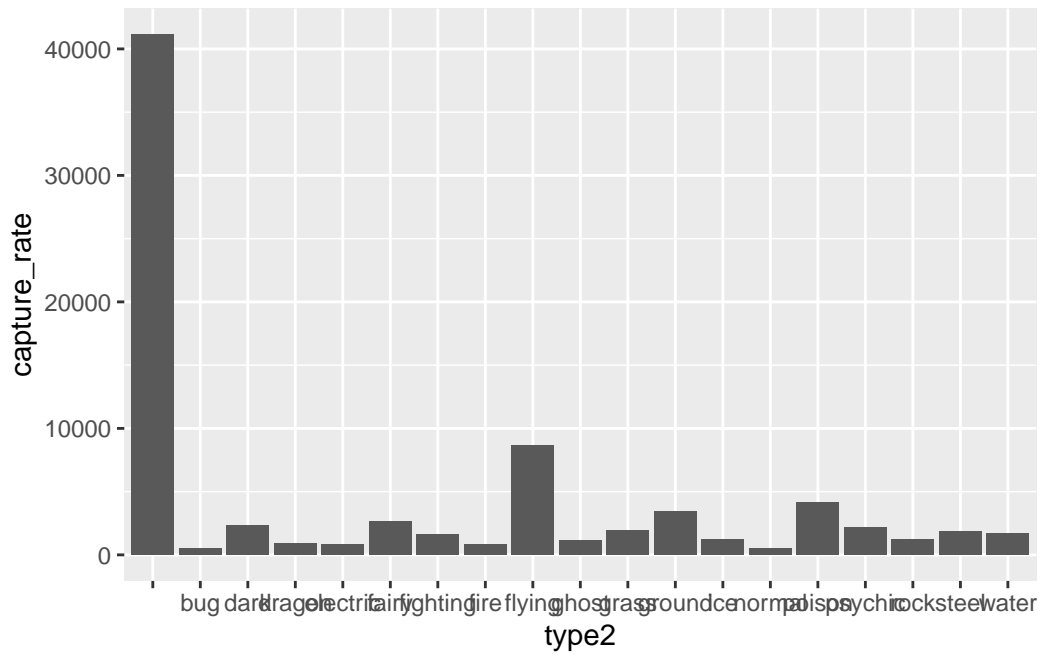
```
ggplot(data = pokemon, mapping = aes(x = type1, y = capture_rate, color=type2)) +
    geom_col()
```

Warning: Removed 1 rows containing missing values (position_stack).
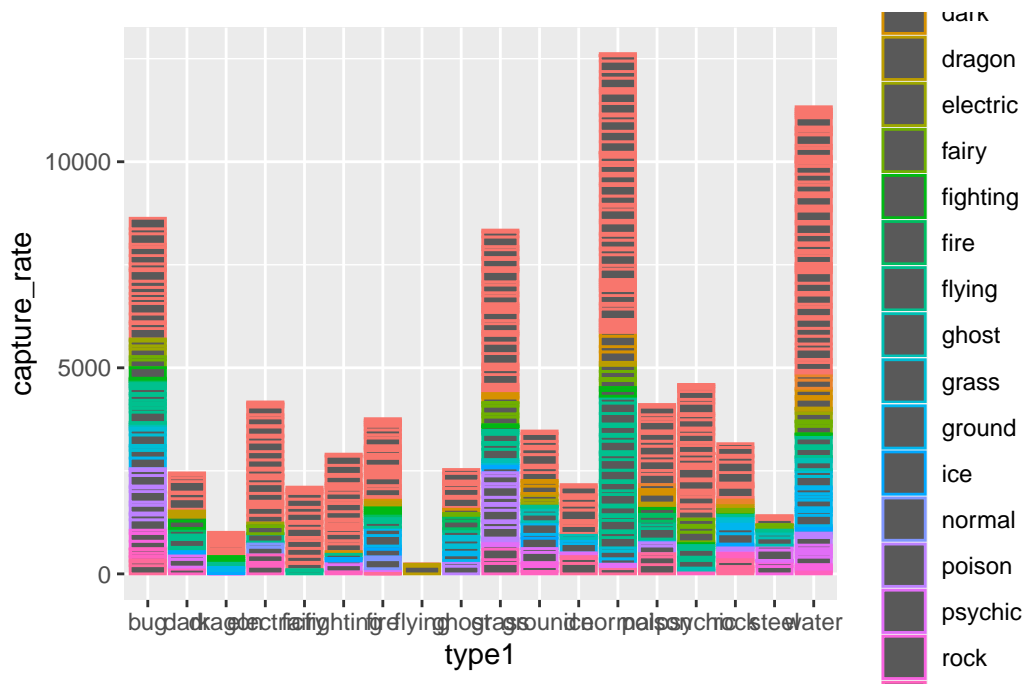
```
ggplot(data = pokemon, mapping = aes(x = type1, y = capture_rate)) +
  geom_boxplot()
```

Warning: Removed 1 rows containing non-finite values (stat_boxplot).

```
ggplot(data = pokemon, mapping = aes(x = type2, y = capture_rate)) +
    geom_boxplot()
```
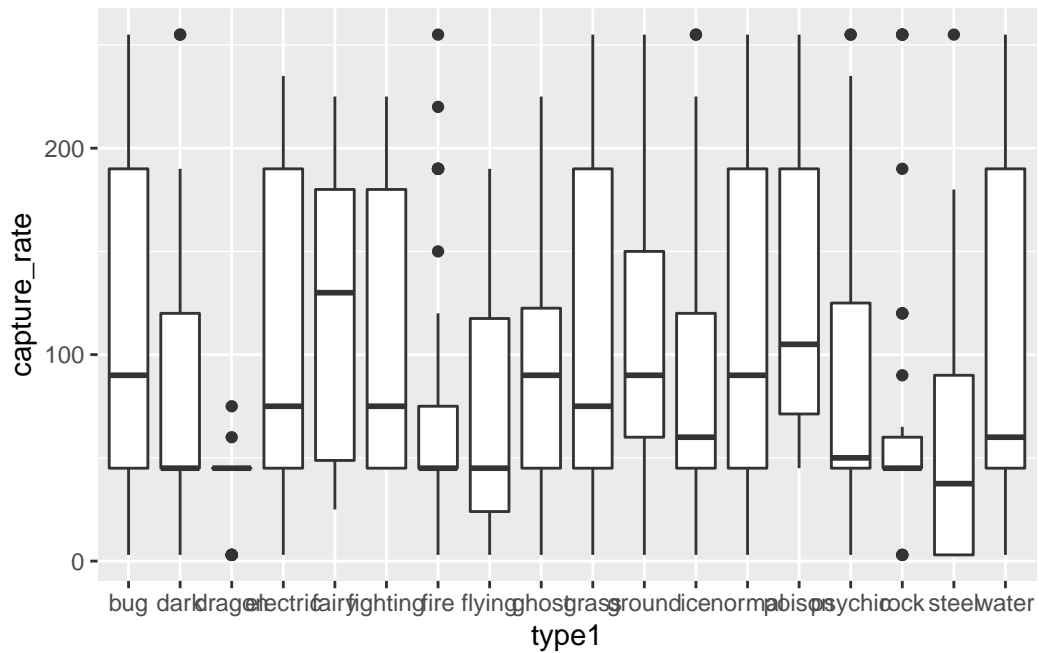
Warning: Removed 1 rows containing non-finite values (stat_boxplot).
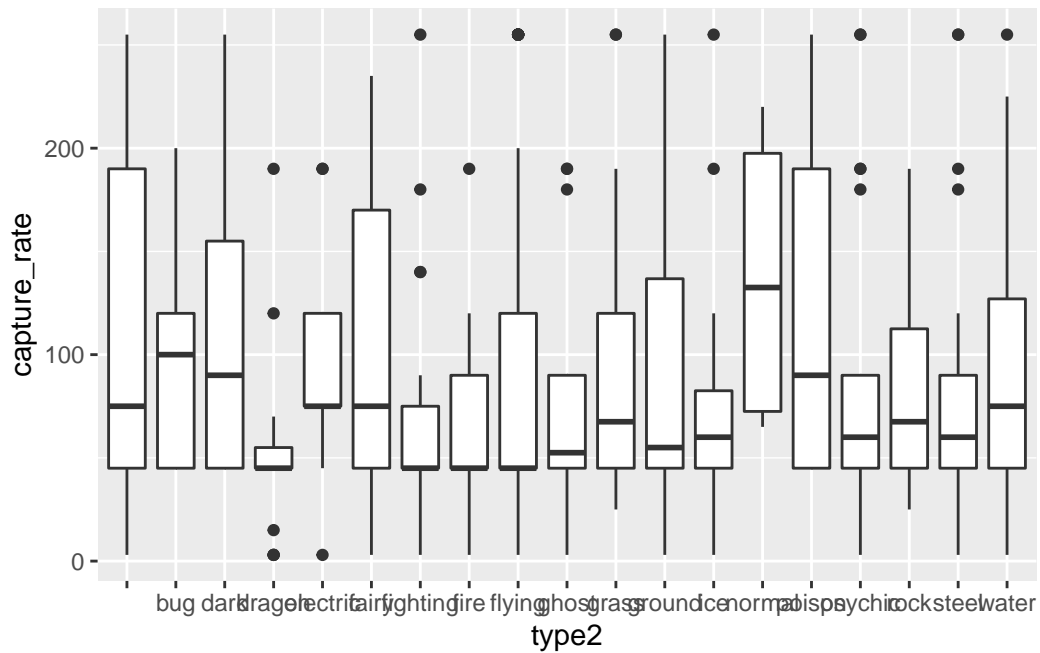
```
ggplot(data = pokemon, mapping = aes(x = type1, y = capture_rate, color = type2)) +
  geom_boxplot()
```

Warning: Removed 1 rows containing non-finite values (stat_boxplot).
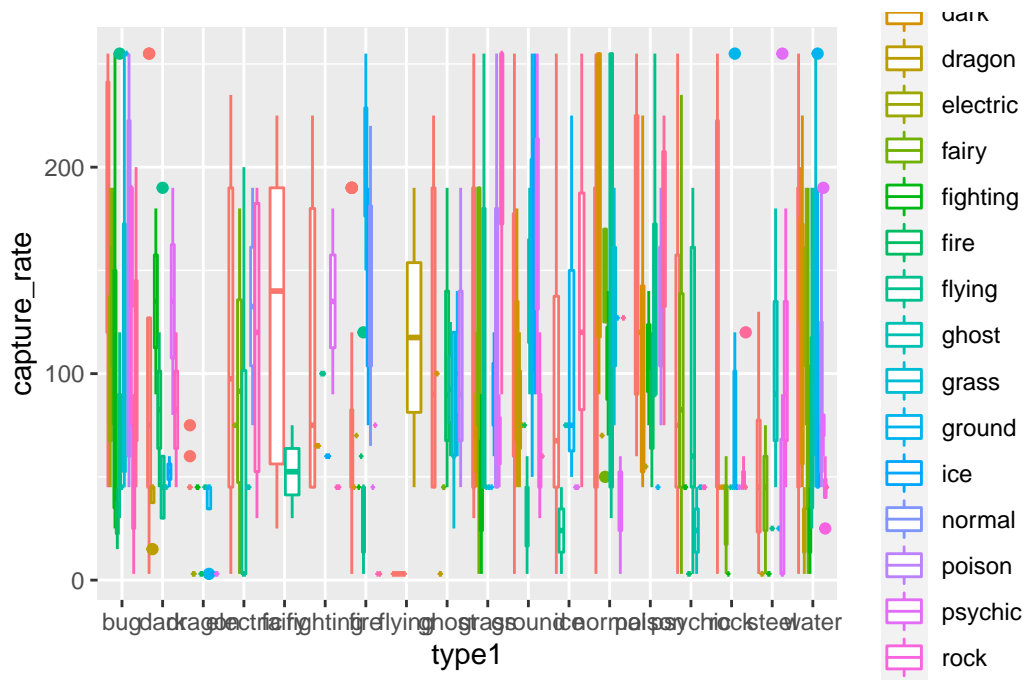
```
# looks very not fun to read so not a good visualization
```

```
unique(pokemon$'type1')
```

```
 [1] grass    fire     water    bug      normal   poison   electric ground
 [9] fairy    fighting psychic  rock     ghost    ice      dragon   dark
[17] steel    flying
18 Levels: bug dark dragon electric fairy fighting fire flying ghost ... water
```

```
unique(pokemon$'type2')
```

```
 [1] poison            flying   dark     electric ice      ground   fairy
 [9] grass    fighting psychic  steel    fire     rock     water    dragon
[17] ghost    bug      normal
19 Levels:  bug dark dragon electric fairy fighting fire flying ghost ... water
```

Creating the models

Additive Model

```
add_capture_model1 <- lm(capture_rate ~ type1 + type2 , data = pokemon)

summary(add_capture_model1)
```

```
Call:
lm(formula = capture_rate ~ type1 + type2, data = pokemon)

Residuals:
    Min      1Q  Median      3Q     Max
-124.31  -58.72  -22.69   54.99  200.14

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)    130.2229     9.9899  13.035  < 2e-16 ***
type1dark      -25.1516    16.8978  -1.488 0.137044
type1dragon    -84.1561    17.1307  -4.913  1.1e-06 ***
type1electric  -19.8664    15.2728  -1.301 0.193730
type1fairy     -11.2566    19.9687  -0.564 0.573116
type1fighting  -22.7922    17.0391  -1.338 0.181413
type1fire      -49.7145    14.0339  -3.542 0.000420 ***
type1flying    -15.7183    45.5092  -0.345 0.729898
type1ghost     -26.5046    17.0770  -1.552 0.121061
type1grass     -18.2445    12.4053  -1.471 0.141782
type1ground     -9.1566    16.2716  -0.563 0.573779
type1ice       -32.1233    18.2712  -1.758 0.079124 .
type1normal     -2.9112    11.8976  -0.245 0.806767
type1poison      6.3736    16.1632   0.394 0.693449
type1psychic   -37.2022    13.9199  -2.673 0.007687 **
type1rock      -49.8281    14.7810  -3.371 0.000786 ***
type1steel     -55.0734    18.4510  -2.985 0.002928 **
type1water     -25.0401    11.6416  -2.151 0.031796 *
type2bug         0.4497    33.7601   0.013 0.989376
type2dark       -3.5216    16.7966  -0.210 0.833987
type2dragon    -52.7569    19.5439  -2.699 0.007100 **
type2electric  -17.8607    25.3505  -0.705 0.481304
type2fairy     -12.4521    14.4726  -0.860 0.389845
type2fighting  -35.2671    15.5354  -2.270 0.023479 *
type2fire      -41.5076    21.3957  -1.940 0.052748 .
type2flying    -18.1967     8.6770  -2.097 0.036312 *
type2ghost     -19.4083    20.5626  -0.944 0.345537
```

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```
type2grass      -12.7945      17.5934   -0.727 0.467306
type2ground       5.8523      13.6488    0.429 0.668205
type2ice        -15.9389      19.7363   -0.808 0.419575
type2normal      42.0676      37.8644    1.111 0.266915
type2poison       4.8400      14.0388    0.345 0.730371
type2psychic    -20.2921      14.7495   -1.376 0.169291
type2rock       -17.8968      20.7653   -0.862 0.389034
type2steel      -24.8187      16.5374   -1.501 0.133831
type2water       -3.8204      19.1714   -0.199 0.842102
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 73.87 on 764 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.1029,    Adjusted R-squared:  0.06176
F-statistic: 2.503 on 35 and 764 DF,  p-value: 5.293e-06
```

Adjusted R-squared: 0.06176

Interactive Model

```r
interact_capture_model1 <- lm(capture_rate ~ type1 * type2 , data = pokemon)
```

```r
summary(interact_capture_model1)
```

```
Call:
lm(formula = capture_rate ~ type1 * type2, data = pokemon)

Residuals:
    Min      1Q  Median      3Q     Max
-121.36  -55.71   -5.00   43.00  195.50

Coefficients: (176 not defined because of singularities)
                        Estimate Std. Error t value Pr(>|t|)
(Intercept)             162.7778    17.8022   9.144  < 2e-16 ***
type1dark               -60.0000    30.8343  -1.946 0.052110 .
type1dragon            -114.0278    28.1477  -4.051 5.73e-05 ***
type1electric           -49.7778    23.1586  -2.149 0.031978 *
type1fairy              -37.7778    25.9509  -1.456 0.145960
```

type1fighting	-55.2778	24.0045	-2.303	0.021612	*
type1fire	-89.5185	22.9825	-3.895	0.000109	***
type1flying	-159.7778	77.5979	-2.059	0.039898	*
type1ghost	-55.5556	30.8343	-1.802	0.072060	.
type1grass	-55.6156	21.7047	-2.562	0.010626	*
type1ground	-42.9778	29.7888	-1.443	0.149584	
type1ice	-64.1944	28.1477	-2.281	0.022902	*
type1normal	-51.8925	20.2592	-2.561	0.010654	*
type1poison	-13.1624	27.4905	-0.479	0.632247	
type1psychic	-69.4635	21.9067	-3.171	0.001593	**
type1rock	-38.4141	28.9052	-1.329	0.184336	
type1steel	-107.0278	41.7498	-2.564	0.010590	*
type1water	-55.7450	20.2592	-2.752	0.006100	**
type2bug	42.9672	54.2750	0.792	0.428857	
type2dark	14.2172	38.9826	0.365	0.715452	
type2dragon	-83.0328	54.2750	-1.530	0.126552	
type2electric	-55.2778	41.7498	-1.324	0.185972	
type2fairy	-30.2778	56.2955	-0.538	0.590878	
type2fighting	-54.4444	47.1002	-1.156	0.248146	
type2fire	-132.7778	56.2955	-2.359	0.018647	*
type2flying	-83.1624	27.4905	-3.025	0.002586	**
type2ghost	-117.7778	77.5979	-1.518	0.129564	
type2grass	-41.1111	35.6044	-1.155	0.248663	
type2ground	92.2222	77.5979	1.188	0.235096	
type2ice	-47.0328	44.6657	-1.053	0.292744	
type2normal	69.2407	55.3492	1.251	0.211404	
type2poison	-26.8687	28.9052	-0.930	0.352960	
type2psychic	-12.0328	35.1343	-0.342	0.732104	
type2rock	-11.1111	47.1002	-0.236	0.813583	
type2steel	-109.1778	38.1814	-2.859	0.004383	**
type2water	-51.1111	47.1002	-1.085	0.278264	
type1dark:type2bug	NA	NA	NA	NA	
type1dragon:type2bug	NA	NA	NA	NA	
type1electric:type2bug	NA	NA	NA	NA	
type1fairy:type2bug	NA	NA	NA	NA	
type1fighting:type2bug	NA	NA	NA	NA	
type1fire:type2bug	NA	NA	NA	NA	
type1flying:type2bug	NA	NA	NA	NA	
type1ghost:type2bug	NA	NA	NA	NA	
type1grass:type2bug	NA	NA	NA	NA	
type1ground:type2bug	NA	NA	NA	NA	
type1ice:type2bug	NA	NA	NA	NA	
type1normal:type2bug	NA	NA	NA	NA	

```
type1poison:type2bug       -72.5826    95.3368   -0.761 0.446744
type1psychic:type2bug            NA         NA       NA       NA
type1rock:type2bug        -122.3308    79.4772   -1.539 0.124256
type1steel:type2bug              NA         NA       NA       NA
type1water:type2bug              NA         NA       NA       NA
type1dark:type2dark              NA         NA       NA       NA
type1dragon:type2dark            NA         NA       NA       NA
type1electric:type2dark          NA         NA       NA       NA
type1fairy:type2dark             NA         NA       NA       NA
type1fighting:type2dark    -56.7172    86.5070   -0.656 0.512295
type1fire:type2dark        -42.4765    86.2290   -0.493 0.622465
type1flying:type2dark            NA         NA       NA       NA
type1ghost:type2dark       -21.4394    88.6454   -0.242 0.808970
type1grass:type2dark       -46.3794    59.7941   -0.776 0.438244
type1ground:type2dark      -29.0172    63.1792   -0.459 0.646187
type1ice:type2dark               NA         NA       NA       NA
type1normal:type2dark       56.6475    55.1298    1.028 0.304563
type1poison:type2dark      -53.8326    62.1286   -0.866 0.386560
type1psychic:type2dark           NA         NA       NA       NA
type1rock:type2dark        -93.5808    87.9930   -1.064 0.287958
type1steel:type2dark             NA         NA       NA       NA
type1water:type2dark             NA         NA       NA       NA
type1dark:type2dragon       17.7550    70.7513    0.251 0.801934
type1dragon:type2dragon          NA         NA       NA       NA
type1electric:type2dragon        NA         NA       NA       NA
type1fairy:type2dragon           NA         NA       NA       NA
type1fighting:type2dragon        NA         NA       NA       NA
type1fire:type2dragon       79.7735    94.1359    0.847 0.397076
type1flying:type2dragon    197.5328   107.2500    1.842 0.065972 .
type1ghost:type2dragon     -21.1894    96.3542   -0.220 0.826011
type1grass:type2dragon           NA         NA       NA       NA
type1ground:type2dragon     45.7328    79.8028    0.573 0.566799
type1ice:type2dragon             NA         NA       NA       NA
type1normal:type2dragon     42.1475    93.5084    0.451 0.652334
type1poison:type2dragon    -11.5826    95.3368   -0.121 0.903340
type1psychic:type2dragon         NA         NA       NA       NA
type1rock:type2dragon        3.6692    79.4772    0.046 0.963192
type1steel:type2dragon      30.2828   100.3814    0.302 0.762997
type1water:type2dragon           NA         NA       NA       NA
type1dark:type2electric          NA         NA       NA       NA
type1dragon:type2electric    9.5278    89.0109    0.107 0.914791
type1electric:type2electric 17.2778    87.5613    0.197 0.843639
type1fairy:type2electric         NA         NA       NA       NA
```

type1fighting:type2electric	NA	NA	NA	NA
type1fire:type2electric	NA	NA	NA	NA
type1flying:type2electric	NA	NA	NA	NA
type1ghost:type2electric	NA	NA	NA	NA
type1grass:type2electric	NA	NA	NA	NA
type1ground:type2electric	10.4778	89.5434	0.117	0.906886
type1ice:type2electric	NA	NA	NA	NA
type1normal:type2electric	NA	NA	NA	NA
type1poison:type2electric	NA	NA	NA	NA
type1psychic:type2electric	NA	NA	NA	NA
type1rock:type2electric	NA	NA	NA	NA
type1steel:type2electric	NA	NA	NA	NA
type1water:type2electric	80.7450	68.4750	1.179	0.238765
type1dark:type2fairy	NA	NA	NA	NA
type1dragon:type2fairy	NA	NA	NA	NA
type1electric:type2fairy	8.7778	78.9990	0.111	0.911562
type1fairy:type2fairy	NA	NA	NA	NA
type1fighting:type2fairy	NA	NA	NA	NA
type1fire:type2fairy	NA	NA	NA	NA
type1flying:type2fairy	NA	NA	NA	NA
type1ghost:type2fairy	-31.9444	97.5066	-0.328	0.743312
type1grass:type2fairy	29.7156	66.8151	0.445	0.656657
type1ground:type2fairy	NA	NA	NA	NA
type1ice:type2fairy	NA	NA	NA	NA
type1normal:type2fairy	54.3925	68.4750	0.794	0.427294
type1poison:type2fairy	NA	NA	NA	NA
type1psychic:type2fairy	35.7968	65.4440	0.547	0.584582
type1rock:type2fairy	-62.5859	80.8705	-0.774	0.439277
type1steel:type2fairy	15.5278	80.6028	0.193	0.847298
type1water:type2fairy	1.4950	68.4750	0.022	0.982588
type1dark:type2fighting	86.6667	75.5283	1.147	0.251619
type1dragon:type2fighting	50.6944	74.4719	0.681	0.496298
type1electric:type2fighting	NA	NA	NA	NA
type1fairy:type2fighting	NA	NA	NA	NA
type1fighting:type2fighting	NA	NA	NA	NA
type1fire:type2fighting	26.1852	58.1417	0.450	0.652599
type1flying:type2fighting	NA	NA	NA	NA
type1ghost:type2fighting	NA	NA	NA	NA
type1grass:type2fighting	-6.7177	65.3767	-0.103	0.918191
type1ground:type2fighting	NA	NA	NA	NA
type1ice:type2fighting	NA	NA	NA	NA
type1normal:type2fighting	48.5592	71.8624	0.676	0.499462
type1poison:type2fighting	12.3291	74.2260	0.166	0.868130

```
type1psychic:type2fighting       6.1302   89.9218    0.068 0.945670
type1rock:type2fighting        -66.9192   91.8778   -0.728 0.466669
type1steel:type2fighting         1.6944   96.6906    0.018 0.986024
type1water:type2fighting       -28.5883   71.8624   -0.398 0.690896
type1dark:type2fire            112.5000   81.5799    1.379 0.168376
type1dragon:type2fire           87.0278   96.6906    0.900 0.368428
type1electric:type2fire             NA        NA       NA       NA
type1fairy:type2fire                NA        NA       NA       NA
type1fighting:type2fire             NA        NA       NA       NA
type1fire:type2fire            119.5185   95.3151    1.254 0.210330
type1flying:type2fire               NA        NA       NA       NA
type1ghost:type2fire           133.8889   75.5283    1.773 0.076759 .
type1grass:type2fire                NA        NA       NA       NA
type1ground:type2fire           87.9778   97.1810    0.905 0.365651
type1ice:type2fire                  NA        NA       NA       NA
type1normal:type2fire               NA        NA       NA       NA
type1poison:type2fire           65.6624   80.3757    0.817 0.414267
type1psychic:type2fire          42.4635   95.0615    0.447 0.655248
type1rock:type2fire                 NA        NA       NA       NA
type1steel:type2fire                NA        NA       NA       NA
type1water:type2fire                NA        NA       NA       NA
type1dark:type2flying           51.3846   50.3037    1.021 0.307413
type1dragon:type2flying         79.4124   51.5484    1.541 0.123927
type1electric:type2flying       38.8291   53.6343    0.724 0.469358
type1fairy:type2flying          10.6624   62.9644    0.169 0.865583
type1fighting:type2flying       75.6624   81.9728    0.923 0.356349
type1fire:type2flying           53.4031   43.7922    1.219 0.223121
type1flying:type2flying             NA        NA       NA       NA
type1ghost:type2flying          68.4402   65.1293    1.051 0.293734
type1grass:type2flying          94.3336   43.1353    2.187 0.029113 *
type1ground:type2flying         -5.6376   56.8127   -0.099 0.920986
type1ice:type2flying             8.5791   63.9012    0.134 0.893243
type1normal:type2flying        114.0079   32.6902    3.488 0.000521 ***
type1poison:type2flying         78.5470   55.6421    1.412 0.158544
type1psychic:type2flying        81.1814   43.2373    1.878 0.060898 .
type1rock:type2flying            3.7988   56.3545    0.067 0.946278
type1steel:type2flying          52.4124   70.9515    0.739 0.460358
type1water:type2flying          56.8439   40.7943    1.393 0.163979
type1dark:type2ghost            60.0000  111.1746    0.540 0.589599
type1dragon:type2ghost              NA        NA       NA       NA
type1electric:type2ghost        49.7778  109.2948    0.455 0.648945
type1fairy:type2ghost               NA        NA       NA       NA
type1fighting:type2ghost            NA        NA       NA       NA
```

```
type1fire:type2ghost            NA         NA       NA       NA
type1flying:type2ghost          NA         NA       NA       NA
type1ghost:type2ghost           NA         NA       NA       NA
type1grass:type2ghost       55.6156   108.9960    0.510 0.610051
type1ground:type2ghost     137.9778    97.1810    1.420 0.156157
type1ice:type2ghost         94.1944   110.4597    0.853 0.394120
type1normal:type2ghost          NA         NA       NA       NA
type1poison:type2ghost          NA         NA       NA       NA
type1psychic:type2ghost     48.4635    95.0615    0.510 0.610361
type1rock:type2ghost            NA         NA       NA       NA
type1steel:type2ghost      167.0278    96.6906    1.727 0.084575 .
type1water:type2ghost      135.7450    94.6954    1.433 0.152210
type1dark:type2grass            NA         NA       NA       NA
type1dragon:type2grass          NA         NA       NA       NA
type1electric:type2grass        NA         NA       NA       NA
type1fairy:type2grass           NA         NA       NA       NA
type1fighting:type2grass        NA         NA       NA       NA
type1fire:type2grass            NA         NA       NA       NA
type1flying:type2grass          NA         NA       NA       NA
type1ghost:type2grass       10.8889    55.1581    0.197 0.843568
type1grass:type2grass      -21.0511    84.4178   -0.249 0.803157
type1ground:type2grass          NA         NA       NA       NA
type1ice:type2grass             NA         NA       NA       NA
type1normal:type2grass      62.7259    64.9111    0.966 0.334245
type1poison:type2grass          NA         NA       NA       NA
type1psychic:type2grass     -7.2032    84.4700   -0.085 0.932070
type1rock:type2grass       -38.2525    68.1067   -0.562 0.574549
type1steel:type2grass           NA         NA       NA       NA
type1water:type2grass       74.0783    57.1200    1.297 0.195141
type1dark:type2ground           NA         NA       NA       NA
type1dragon:type2ground   -106.4722    89.0109   -1.196 0.232077
type1electric:type2ground       NA         NA       NA       NA
type1fairy:type2ground          NA         NA       NA       NA
type1fighting:type2ground       NA         NA       NA       NA
type1fire:type2ground       37.0185    95.3151    0.388 0.697865
type1flying:type2ground         NA         NA       NA       NA
type1ghost:type2ground     -99.4444    97.5066   -1.020 0.308177
type1grass:type2ground    -154.3844   108.9960   -1.416 0.157143
type1ground:type2ground    -59.5222    97.1810   -0.612 0.540434
type1ice:type2ground       -74.1389    91.6424   -0.809 0.418817
type1normal:type2ground    -76.1075   108.7174   -0.700 0.484154
type1poison:type2ground   -196.8376    96.5013   -2.040 0.041790 *
type1psychic:type2ground        NA         NA       NA       NA
```

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```
type1rock:type2ground      -124.0859    86.5493   -1.434 0.152151
type1steel:type2ground     -122.9722   114.6826   -1.072 0.284001
type1water:type2ground      -94.8106    82.1510   -1.154 0.248894
type1dark:type2ice           -3.2450    74.0346   -0.044 0.965053
type1dragon:type2ice          1.2828    90.4153    0.014 0.988685
type1electric:type2ice           NA         NA       NA       NA
type1fairy:type2ice              NA         NA       NA       NA
type1fighting:type2ice       -0.4672    89.2123   -0.005 0.995823
type1fire:type2ice          106.2735    71.1236    1.494 0.135618
type1flying:type2ice             NA         NA       NA       NA
type1ghost:type2ice              NA         NA       NA       NA
type1grass:type2ice          29.8706    70.7210    0.422 0.672896
type1ground:type2ice         99.7328    73.6053    1.355 0.175910
type1ice:type2ice                NA         NA       NA       NA
type1normal:type2ice             NA         NA       NA       NA
type1poison:type2ice             NA         NA       NA       NA
type1psychic:type2ice            NA         NA       NA       NA
type1rock:type2ice          -32.3308    73.2521   -0.441 0.659100
type1steel:type2ice              NA         NA       NA       NA
type1water:type2ice              NA         NA       NA       NA
type1dark:type2normal            NA         NA       NA       NA
type1dragon:type2normal          NA         NA       NA       NA
type1electric:type2normal   -49.7407    78.3275   -0.635 0.525635
type1fairy:type2normal           NA         NA       NA       NA
type1fighting:type2normal        NA         NA       NA       NA
type1fire:type2normal            NA         NA       NA       NA
type1flying:type2normal          NA         NA       NA       NA
type1ghost:type2normal           NA         NA       NA       NA
type1grass:type2normal           NA         NA       NA       NA
type1ground:type2normal          NA         NA       NA       NA
type1ice:type2normal             NA         NA       NA       NA
type1normal:type2normal          NA         NA       NA       NA
type1poison:type2normal          NA         NA       NA       NA
type1psychic:type2normal         NA         NA       NA       NA
type1rock:type2normal            NA         NA       NA       NA
type1steel:type2normal           NA         NA       NA       NA
type1water:type2normal           NA         NA       NA       NA
type1dark:type2poison            NA         NA       NA       NA
type1dragon:type2poison          NA         NA       NA       NA
type1electric:type2poison        NA         NA       NA       NA
type1fairy:type2poison           NA         NA       NA       NA
type1fighting:type2poison        NA         NA       NA       NA
type1fire:type2poison            NA         NA       NA       NA
```

```
type1flying:type2poison       NA       NA      NA       NA
type1ghost:type2poison    27.9798  58.0590   0.482 0.630029
type1grass:type2poison    42.5637  37.3785   1.139 0.255250
type1ground:type2poison       NA       NA      NA       NA
type1ice:type2poison          NA       NA      NA       NA
type1normal:type2poison       NA       NA      NA       NA
type1poison:type2poison    9.7533  64.2385   0.152 0.879370
type1psychic:type2poison      NA       NA      NA       NA
type1rock:type2poison    -52.4949  84.0156  -0.625 0.532312
type1steel:type2poison        NA       NA      NA       NA
type1water:type2poison    18.1692  53.2028   0.342 0.732833
type1dark:type2psychic    44.2550  68.7060   0.644 0.519730
type1dragon:type2psychic -33.7172  67.5430  -0.499 0.617814
type1electric:type2psychic    NA       NA      NA       NA
type1fairy:type2psychic       NA       NA      NA       NA
type1fighting:type2psychic 39.5328 65.9240   0.600 0.548939
type1fire:type2psychic   -16.2265  84.5590  -0.192 0.847886
type1flying:type2psychic      NA       NA      NA       NA
type1ghost:type2psychic       NA       NA      NA       NA
type1grass:type2psychic  -27.6294  65.1219  -0.424 0.671511
type1ground:type2psychic  64.7328  68.2432   0.949 0.343206
type1ice:type2psychic    -41.5505  67.5430  -0.615 0.538662
type1normal:type2psychic -62.8525  56.8282  -1.106 0.269142
type1poison:type2psychic      NA       NA      NA       NA
type1psychic:type2psychic     NA       NA      NA       NA
type1rock:type2psychic   -67.3308  67.8622  -0.992 0.321493
type1steel:type2psychic   15.7828  60.0941   0.263 0.792918
type1water:type2psychic       NA       NA      NA       NA
type1dark:type2rock           NA       NA      NA       NA
type1dragon:type2rock         NA       NA      NA       NA
type1electric:type2rock       NA       NA      NA       NA
type1fairy:type2rock          NA       NA      NA       NA
type1fighting:type2rock       NA       NA      NA       NA
type1fire:type2rock       12.8519  90.1899   0.142 0.886732
type1flying:type2rock         NA       NA      NA       NA
type1ghost:type2rock          NA       NA      NA       NA
type1grass:type2rock          NA       NA      NA       NA
type1ground:type2rock    -38.6889  68.4864  -0.565 0.572332
type1ice:type2rock            NA       NA      NA       NA
type1normal:type2rock         NA       NA      NA       NA
type1poison:type2rock         NA       NA      NA       NA
type1psychic:type2rock        NA       NA      NA       NA
type1rock:type2rock           NA       NA      NA       NA
```

```
type1steel:type2rock        60.3611    74.4719    0.811 0.417944
type1water:type2rock       -52.1717    61.1398   -0.853 0.393805
type1dark:type2steel        88.9000    70.3130    1.264 0.206570
type1dragon:type2steel          NA         NA       NA       NA
type1electric:type2steel   111.1778    55.7078    1.996 0.046391 *
type1fairy:type2steel           NA         NA       NA       NA
type1fighting:type2steel    46.6778    86.1489    0.542 0.588128
type1fire:type2steel        38.9185    85.8698    0.453 0.650540
type1flying:type2steel          NA         NA       NA       NA
type1ghost:type2steel           NA         NA       NA       NA
type1grass:type2steel      202.0156    59.2748    3.408 0.000696 ***
type1ground:type2steel      49.3778    87.9363    0.562 0.574643
type1ice:type2steel             NA         NA       NA       NA
type1normal:type2steel          NA         NA       NA       NA
type1poison:type2steel          NA         NA       NA       NA
type1psychic:type2steel     60.8635    85.5881    0.711 0.477271
type1rock:type2steel        34.8141    62.2730    0.559 0.576320
type1steel:type2steel           NA         NA       NA       NA
type1water:type2steel       47.1450    85.1813    0.553 0.580139
type1dark:type2water            NA         NA       NA       NA
type1dragon:type2water          NA         NA       NA       NA
type1electric:type2water        NA         NA       NA       NA
type1fairy:type2water           NA         NA       NA       NA
type1fighting:type2water        NA         NA       NA       NA
type1fire:type2water       -19.1481    90.1899   -0.212 0.831934
type1flying:type2water          NA         NA       NA       NA
type1ghost:type2water           NA         NA       NA       NA
type1grass:type2water           NA         NA       NA       NA
type1ground:type2water          NA         NA       NA       NA
type1ice:type2water         92.5278    67.7887    1.365 0.172755
type1normal:type2water      67.2259    89.5347    0.751 0.453030
type1poison:type2water      64.8291    67.5184    0.960 0.337337
type1psychic:type2water         NA         NA       NA       NA
type1rock:type2water       -15.7525    60.7270   -0.259 0.795412
type1steel:type2water           NA         NA       NA       NA
type1water:type2water           NA         NA       NA       NA
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 75.53 on 634 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.2216,    Adjusted R-squared:  0.01904
F-statistic: 1.094 on 165 and 634 DF,  p-value: 0.2246
```

Adjusted R-squared: 0.01904
Nested F-test

```
anova(add_capture_model1, interact_capture_model1)
```

```
Analysis of Variance Table

Model 1: capture_rate ~ type1 + type2
Model 2: capture_rate ~ type1 * type2
  Res.Df      RSS  Df Sum of Sq      F Pr(>F)
1     764 4168465
2     634 3616666 130    551799 0.7441 0.9807
```

The p-value is higher than 0.05 meaning we can go with the additive model in this case. The adjusted r-square is also higher in the additive model, meaning that it would be better to, use the additive model if we go with this question.

Opinion: Since the additive model seems to look better, for analysis on the EDA we should focus on this. There are a lot of variables, so analyzing them may be difficult, but possible.

How do different pokemon's base stats influence capture rate?

Stats

- attack
- base_happiness
- base_egg_steps
- base_total
- defense
- hp
- sp_attack
- sp_defense
- speed The base stats I'll focus on are attack, hp, defense, and speed. I'm not sure what are important base stats for pokemon but I'm guessing.

```
ggplot(data = pokemon, mapping = aes(x = attack, y = capture_rate)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE, formula = y~x)
```

```
Warning: Removed 1 rows containing non-finite values (stat_smooth).
```

Warning: Removed 1 rows containing missing values (geom_point).
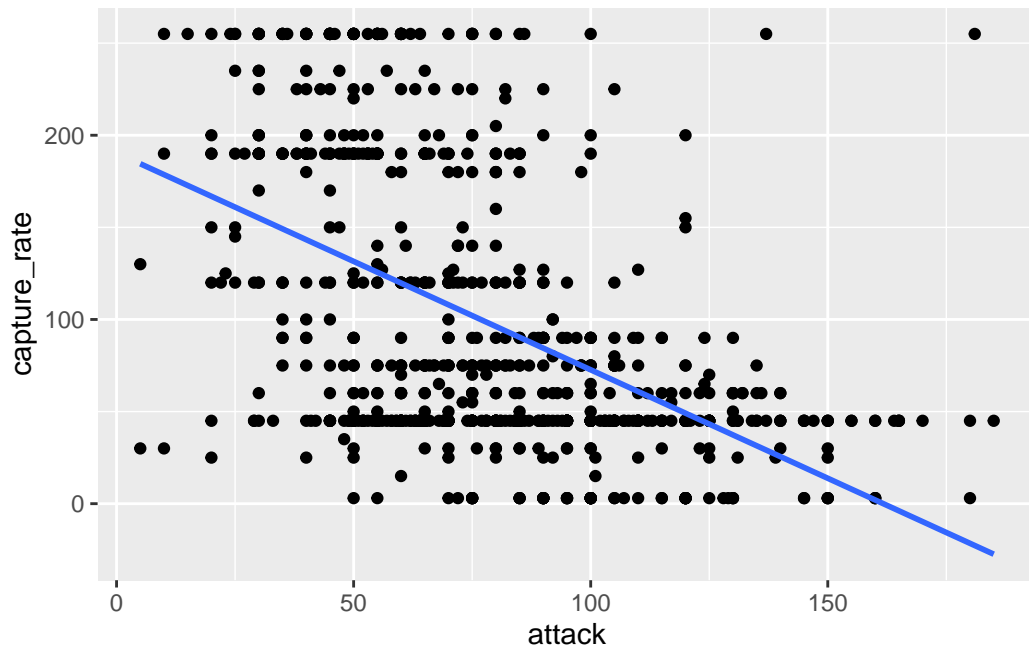

```
ggplot(data = pokemon, mapping = aes(x = defense, y = capture_rate)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE, formula = y~x)
```

Warning: Removed 1 rows containing non-finite values (stat_smooth).

Warning: Removed 1 rows containing missing values (geom_point).

```
ggplot(data = pokemon, mapping = aes(x = hp, y = capture_rate)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE, formula = y~x)
```

Warning: Removed 1 rows containing non-finite values (stat_smooth).

Warning: Removed 1 rows containing missing values (geom_point).

```
ggplot(data = pokemon, mapping = aes(x = speed, y = capture_rate)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE, formula = y~x)
```

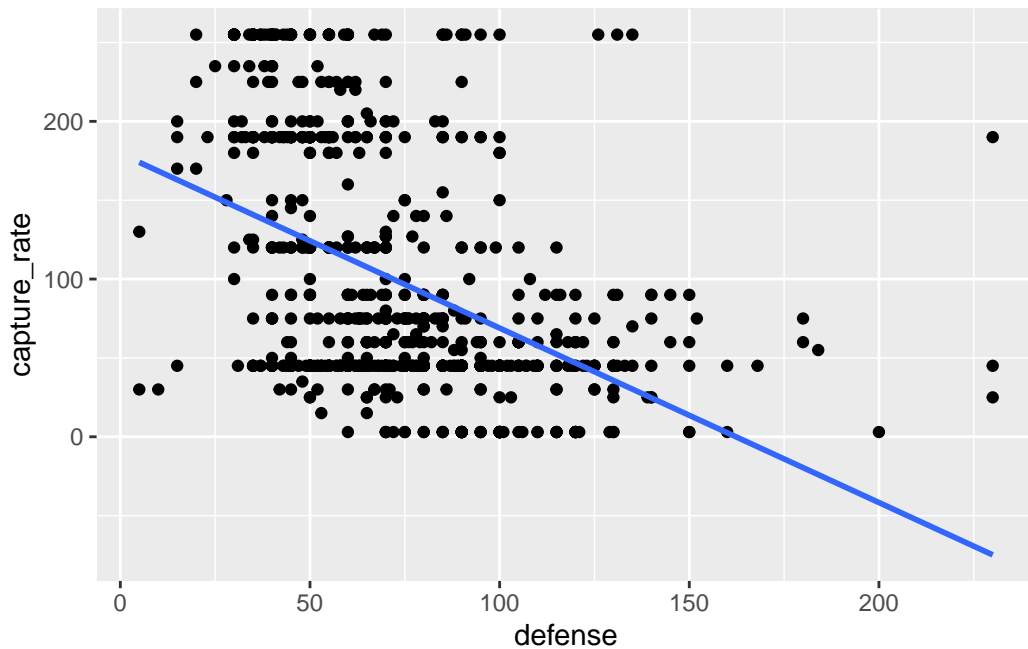Warning: Removed 1 rows containing non-finite values (stat_smooth).
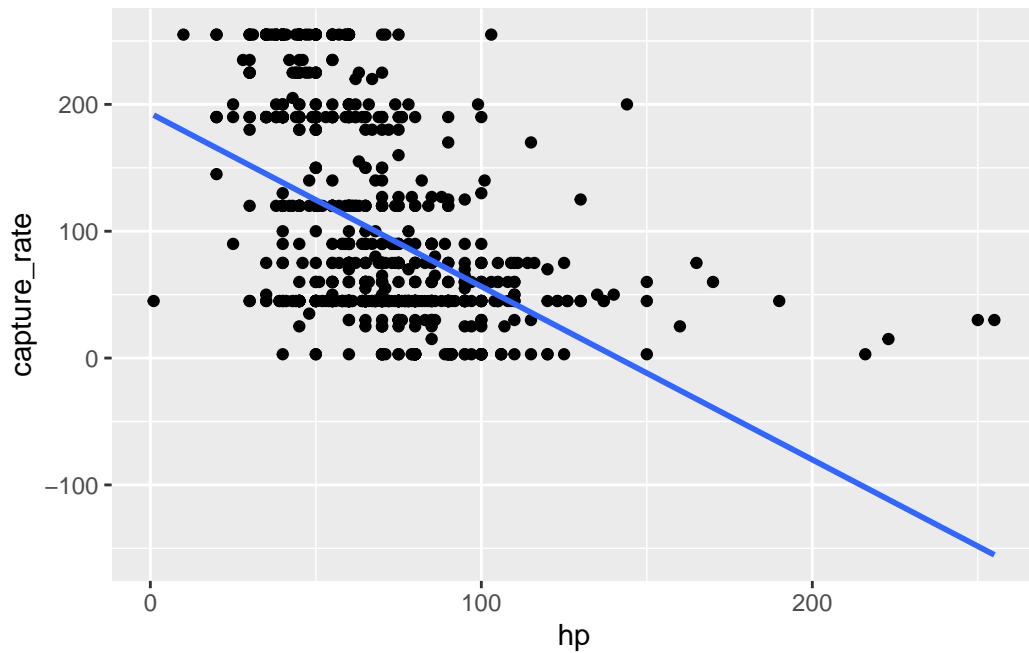
Warning: Removed 1 rows containing missing values (geom_point).
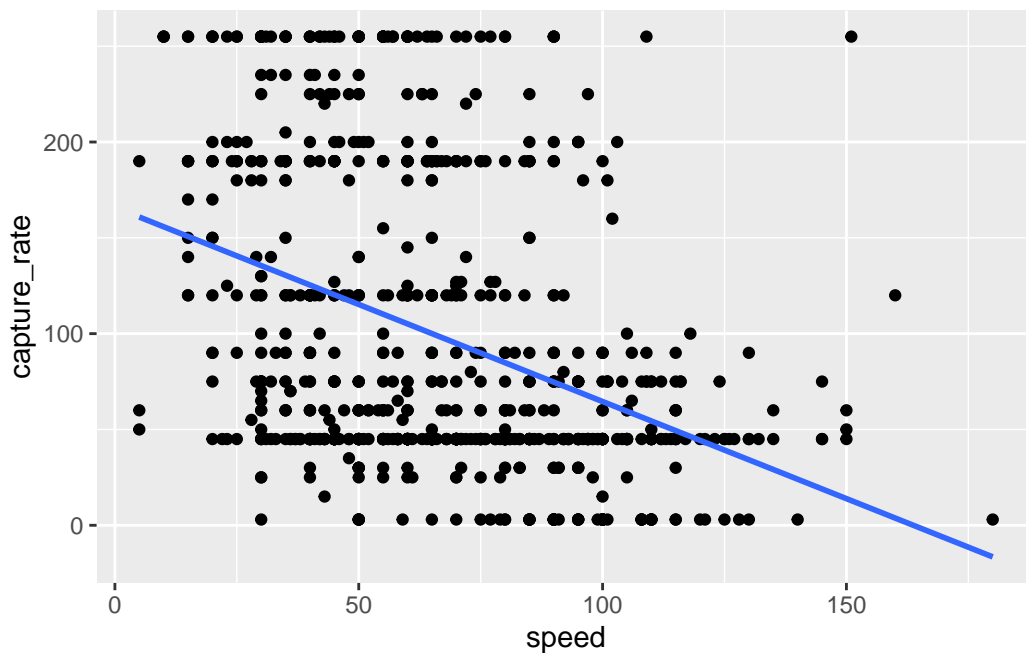
Making the model

Additive Model

```r
additive_capture_model2 <- lm(capture_rate ~ attack + defense + hp + speed, data = pokemon
```

```r
summary(additive_capture_model2)
```

```
Call:
lm(formula = capture_rate ~ attack + defense + hp + speed, data = pokemon)

Residuals:
     Min       1Q   Median       3Q      Max
-150.832  -36.856   -5.036   36.345  255.371

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 288.48251    7.67680  37.578  < 2e-16 ***
attack       -0.29466    0.08042  -3.664 0.000265 ***
```

```
defense      -0.77384    0.07492 -10.329  < 2e-16 ***
hp           -0.86774    0.08251 -10.517  < 2e-16 ***
speed        -0.76101    0.07525 -10.113  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 56.4 on 795 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.4558,    Adjusted R-squared:  0.453
F-statistic: 166.4 on 4 and 795 DF,  p-value: < 2.2e-16
```

Adjusted R-squared: 0.453

Interactive Model

```
interact_capture_model2 <- lm(capture_rate ~ attack * defense * hp * speed, data = pokemon
```

```
summary(interact_capture_model2)
```

```
Call:
lm(formula = capture_rate ~ attack * defense * hp * speed, data = pokemon)

Residuals:
     Min       1Q   Median       3Q      Max
-167.956  -31.949   -1.533   28.992  219.782

Coefficients:
                          Estimate Std. Error t value Pr(>|t|)
(Intercept)              2.615e+02  5.582e+01   4.686 3.29e-06 ***
attack                  -7.279e-02  9.924e-01  -0.073  0.94154
defense                  1.677e-01  5.320e-01   0.315  0.75270
hp                      -7.348e-02  8.772e-01  -0.084  0.93326
speed                    1.101e+00  9.999e-01   1.101  0.27102
attack:defense          -1.027e-02  1.017e-02  -1.010  0.31278
attack:hp               -1.235e-02  1.323e-02  -0.933  0.35101
defense:hp              -1.291e-02  1.015e-02  -1.273  0.20355
attack:speed            -2.156e-02  1.591e-02  -1.355  0.17572
defense:speed           -3.126e-02  1.115e-02  -2.803  0.00519 **
hp:speed                -2.085e-02  1.636e-02  -1.274  0.20303
```

```
attack:defense:hp         1.798e-04  1.415e-04   1.270  0.20436
attack:defense:speed      3.228e-04  1.606e-04   2.010  0.04482 *
attack:hp:speed           2.942e-04  2.235e-04   1.316  0.18844
defense:hp:speed          2.655e-04  1.861e-04   1.426  0.15422
attack:defense:hp:speed -3.217e-06  2.283e-06  -1.409  0.15925
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 55.09 on 784 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.488, Adjusted R-squared:  0.4782
F-statistic: 49.81 on 15 and 784 DF,  p-value: < 2.2e-16
```

Adjusted R-squared: 0.4782

Nested F-test

```
  anova(additive_capture_model2, interact_capture_model2)
```

```
Analysis of Variance Table

Model 1: capture_rate ~ attack + defense + hp + speed
Model 2: capture_rate ~ attack * defense * hp * speed
  Res.Df      RSS Df Sum of Sq      F    Pr(>F)
1    795 2528696
2    784 2379127 11    149569 4.4807 1.385e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

The p-value is below 0.05 implying that the change from additive to interactive is necessary, but I feel like the adjusted r-square doesn't justify the change.

Opinion: Would be interesting to look at but haven't tested removing some explanatory variables to see how it affects the model.

How do a pokemon's type 1, and base stats affect its capture rate?

```
ggplot(data = pokemon, mapping = aes(x = attack, y = capture_rate, color=type1)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE, formula = y~x)
```

Warning: Removed 1 rows containing non-finite values (stat_smooth).

Warning: Removed 1 rows containing missing values (geom_point).
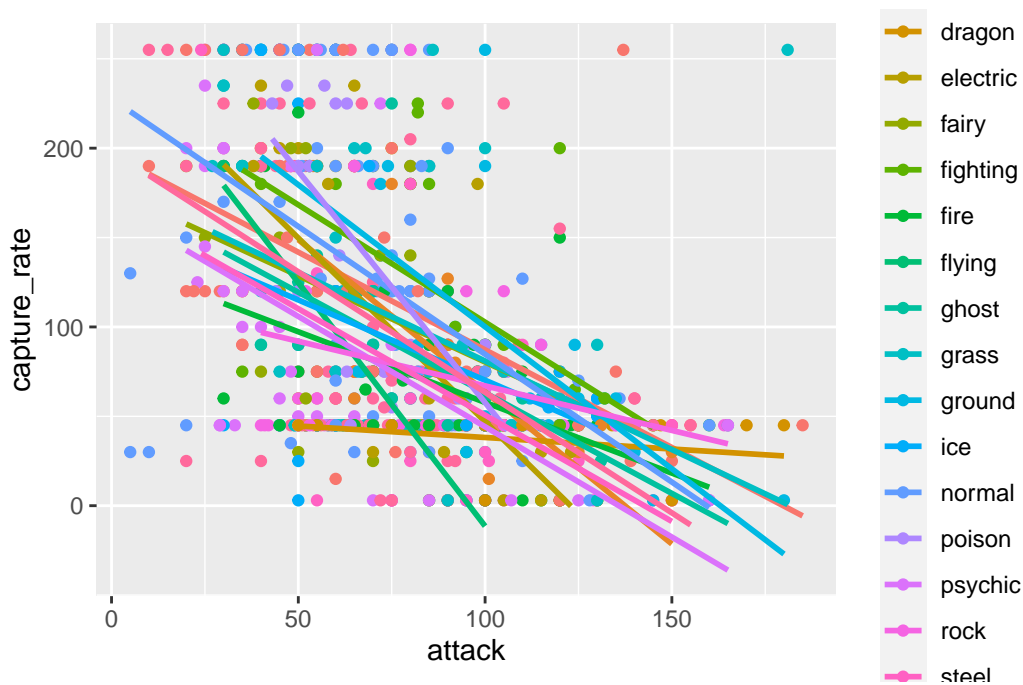

```
ggplot(data = pokemon, mapping = aes(x = defense, y = capture_rate, color=type1)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE, formula = y~x)
```

Warning: Removed 1 rows containing non-finite values (stat_smooth).

Warning: Removed 1 rows containing missing values (geom_point).
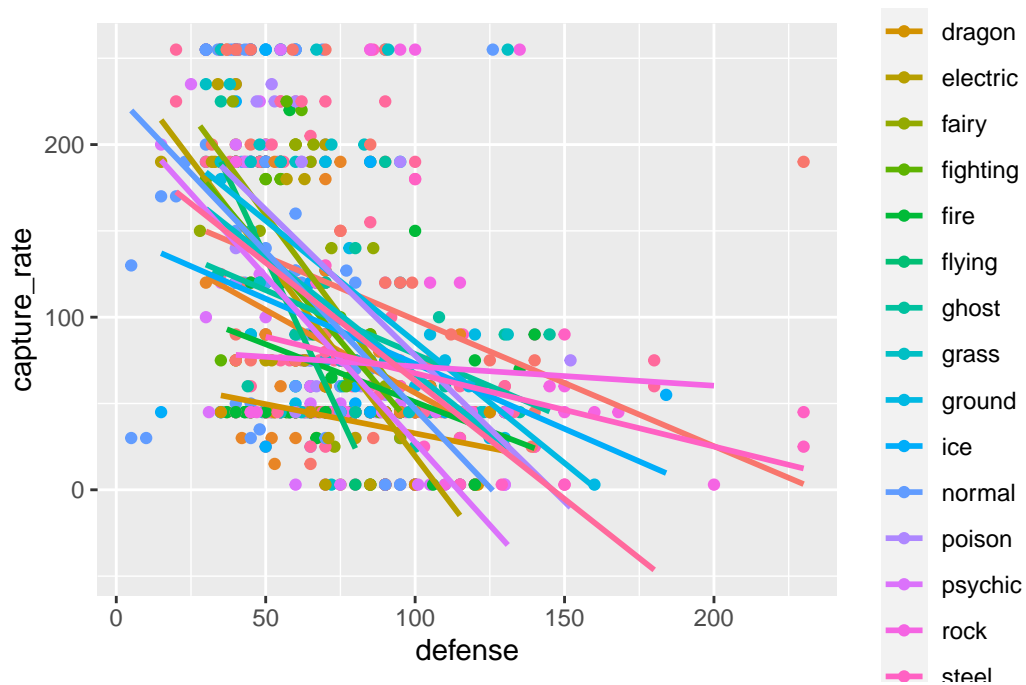
```
ggplot(data = pokemon, mapping = aes(x = hp, y = capture_rate, color=type1)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE, formula = y~x)
```

Warning: Removed 1 rows containing non-finite values (stat_smooth).

Warning: Removed 1 rows containing missing values (geom_point).
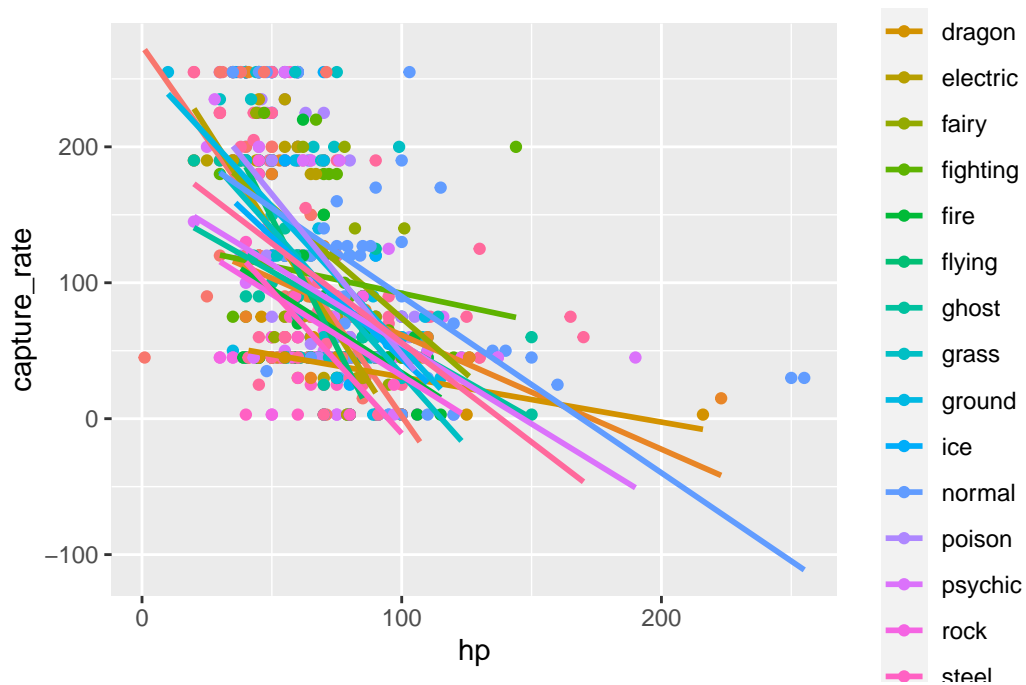
```
ggplot(data = pokemon, mapping = aes(x = speed, y = capture_rate, color=type1)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE, formula = y~x)
```

Warning: Removed 1 rows containing non-finite values (stat_smooth).

Warning: Removed 1 rows containing missing values (geom_point).
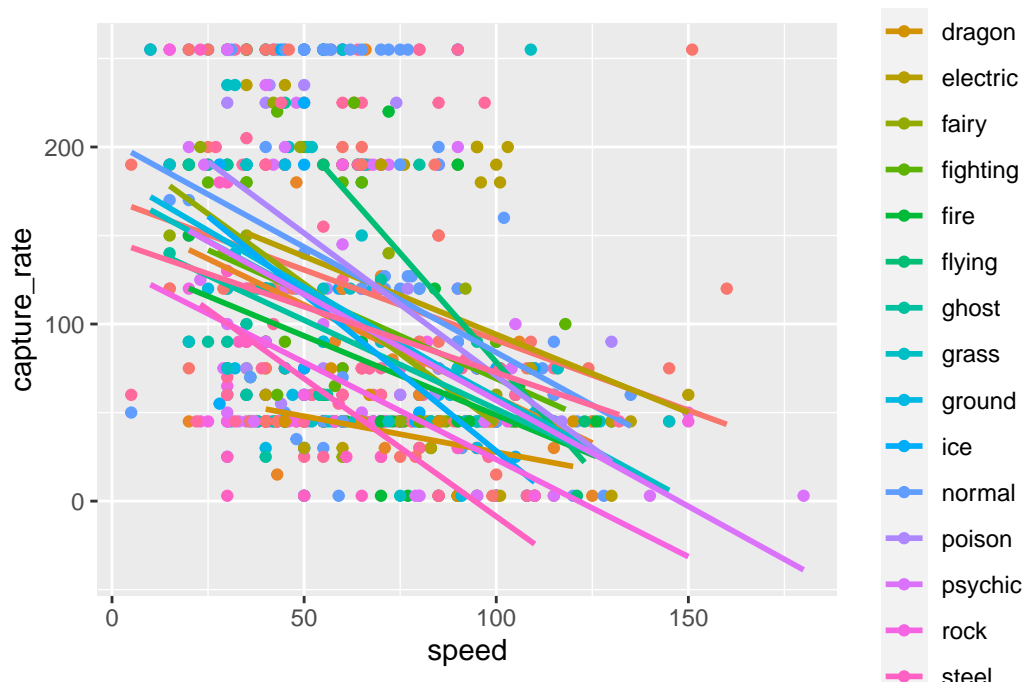
Making the models

Additive Model

```
add_capture_model3 <- lm(capture_rate ~ attack + defense + hp + speed + type1, data = poke
```

```
summary(add_capture_model3)
```

```
Call:
lm(formula = capture_rate ~ attack + defense + hp + speed + type1,
    data = pokemon)

Residuals:
     Min       1Q   Median       3Q      Max
-155.637  -33.568   -5.108   34.945  251.703

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  288.19999    9.46958   30.434   < 2e-16 ***
```

```
attack          -0.28415      0.08353   -3.402 0.000703 ***
defense         -0.68466      0.07920   -8.645  < 2e-16 ***
hp              -0.91384      0.08376  -10.911  < 2e-16 ***
speed           -0.75665      0.07737   -9.780  < 2e-16 ***
type1dark       -7.20677     12.26721   -0.587 0.557050
type1dragon    -31.01207     12.72544   -2.437 0.015032 *
type1electric    1.14834     11.13736    0.103 0.917905
type1fairy       1.24404     14.69045    0.085 0.932535
type1fighting    3.10369     12.57373    0.247 0.805098
type1fire      -27.92008     10.14322   -2.753 0.006050 **
type1flying     -7.86696     32.73360   -0.240 0.810135
type1ghost     -17.22500     12.50938   -1.377 0.168919
type1grass      -7.39061      9.07697   -0.814 0.415771
type1ground     16.75714     11.91219    1.407 0.159909
type1ice       -10.61370     13.30334   -0.798 0.425217
type1normal     16.97244      8.68957    1.953 0.051154 .
type1poison     17.33953     11.77264    1.473 0.141191
type1psychic   -11.96559     10.17540   -1.176 0.239981
type1rock      -21.10628     10.79356   -1.955 0.050887 .
type1steel     -16.68195     13.49779   -1.236 0.216868
type1water      -5.11250      8.39177   -0.609 0.542551
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 55.31 on 778 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.4878,    Adjusted R-squared:  0.474
F-statistic: 35.28 on 21 and 778 DF,  p-value: < 2.2e-16
```

Adjusted R-squared: 0.474

Interactive Model

```
interact_capture_model3 <- lm(capture_rate ~ attack * defense * hp * speed * type1, data =

summary(interact_capture_model3)
```

```
Call:
lm(formula = capture_rate ~ attack * defense * hp * speed * type1,
```

```
    data = pokemon)

Residuals:
     Min       1Q    Median       3Q       Max
-164.734  -21.905   -0.044   19.524   167.492

Coefficients: (13 not defined because of singularities)
                                  Estimate Std. Error t value Pr(>|t|)
(Intercept)                      5.348e+02  3.226e+02   1.658   0.0980 .
attack                          -3.160e+00  5.142e+00  -0.615   0.5391
defense                         -1.045e+00  1.921e+00  -0.544   0.5867
hp                              -4.287e+00  7.442e+00  -0.576   0.5648
speed                           -3.486e+00  4.601e+00  -0.758   0.4490
type1dark                       -2.878e+02  2.015e+03  -0.143   0.8865
type1dragon                      6.287e+02  2.823e+03   0.223   0.8239
type1electric                   -1.538e+03  1.948e+03  -0.790   0.4301
type1fairy                       3.845e+03  5.518e+03   0.697   0.4861
type1fighting                   -1.388e+03  2.283e+03  -0.608   0.5433
type1fire                       -4.802e+02  1.295e+03  -0.371   0.7108
type1flying                     -1.044e+01  1.138e+02  -0.092   0.9270
type1ghost                      -8.899e+01  2.189e+03  -0.041   0.9676
type1grass                      -4.479e+02  5.990e+02  -0.748   0.4549
type1ground                      5.883e+02  1.284e+03   0.458   0.6471
type1ice                         5.326e+03  5.950e+03   0.895   0.3711
type1normal                     -6.812e+02  4.316e+02  -1.578   0.1151
type1poison                      1.895e+03  4.355e+03   0.435   0.6636
type1psychic                    -8.510e+02  4.937e+02  -1.724   0.0854 .
type1rock                       -1.297e+03  1.197e+03  -1.084   0.2790
type1steel                      -3.740e+03  4.089e+03  -0.915   0.3608
type1water                      -6.199e+02  5.192e+02  -1.194   0.2330
attack:defense                   8.322e-03  5.955e-02   0.140   0.8889
attack:hp                        2.394e-02  9.569e-02   0.250   0.8026
defense:hp                      -1.123e-02  6.391e-02  -0.176   0.8606
attack:speed                    -4.060e-03  8.060e-02  -0.050   0.9598
defense:speed                    5.168e-02  4.937e-02   1.047   0.2958
hp:speed                         2.367e-02  8.996e-02   0.263   0.7925
attack:type1dark                 7.279e+00  2.766e+01   0.263   0.7925
attack:type1dragon              -9.930e-01  2.853e+01  -0.035   0.9723
attack:type1electric             2.961e+01  2.870e+01   1.032   0.3026
attack:type1fairy               -1.223e+02  1.481e+02  -0.826   0.4092
attack:type1fighting             1.505e+01  2.728e+01   0.552   0.5815
attack:type1fire                -1.278e+00  2.046e+01  -0.062   0.9502
attack:type1flying              -2.546e+00  2.713e+00  -0.938   0.3486
```

```
attack:type1ghost         3.692e+00  3.003e+01    0.123   0.9022
attack:type1grass         8.333e+00  9.056e+00    0.920   0.3579
attack:type1ground       -6.966e+00  1.570e+01   -0.444   0.6574
attack:type1ice          -8.548e+01  8.607e+01   -0.993   0.3211
attack:type1normal        1.645e+01  6.893e+00    2.387   0.0174 *
attack:type1poison       -3.617e+01  6.195e+01   -0.584   0.5596
attack:type1psychic       2.491e+01  1.130e+01    2.206   0.0278 *
attack:type1rock          1.515e+01  1.864e+01    0.812   0.4170
attack:type1steel         3.330e+01  4.745e+01    0.702   0.4832
attack:type1water         8.884e+00  8.194e+00    1.084   0.2788
defense:type1dark         1.516e+01  5.461e+01    0.278   0.7814
defense:type1dragon      -1.495e+01  3.527e+01   -0.424   0.6719
defense:type1electric     2.070e+01  3.089e+01    0.670   0.5031
defense:type1fairy       -5.166e+01  7.549e+01   -0.684   0.4941
defense:type1fighting     2.872e+01  5.267e+01    0.545   0.5858
defense:type1fire        -2.044e+00  1.848e+01   -0.111   0.9120
defense:type1flying       2.501e+00  3.901e+00    0.641   0.5218
defense:type1ghost        2.804e+00  2.228e+01    0.126   0.8999
defense:type1grass        6.532e+00  7.742e+00    0.844   0.3992
defense:type1ground      -7.028e+00  1.649e+01   -0.426   0.6702
defense:type1ice         -6.604e+01  1.050e+02   -0.629   0.5297
defense:type1normal       5.580e+00  6.723e+00    0.830   0.4070
defense:type1poison      -1.570e+01  6.358e+01   -0.247   0.8050
defense:type1psychic      6.970e+00  5.908e+00    1.180   0.2386
defense:type1rock         8.395e+00  1.028e+01    0.817   0.4144
defense:type1steel        3.201e+01  4.133e+01    0.775   0.4389
defense:type1water        2.290e+00  5.519e+00    0.415   0.6784
hp:type1dark              1.026e+01  3.514e+01    0.292   0.7705
hp:type1dragon           -2.033e+01  5.378e+01   -0.378   0.7056
hp:type1electric          2.487e+01  3.399e+01    0.732   0.4647
hp:type1fairy            -7.648e+01  1.006e+02   -0.760   0.4476
hp:type1fighting          5.607e+00  3.644e+01    0.154   0.8778
hp:type1fire              2.170e+01  2.563e+01    0.847   0.3975
hp:type1flying                   NA         NA       NA       NA
hp:type1ghost            -3.676e+00  4.243e+01   -0.087   0.9310
hp:type1grass             8.261e+00  1.245e+01    0.664   0.5072
hp:type1ground           -1.671e+00  1.692e+01   -0.099   0.9214
hp:type1ice              -5.700e+01  7.555e+01   -0.754   0.4510
hp:type1normal            7.474e+00  8.081e+00    0.925   0.3555
hp:type1poison           -1.529e+01  7.540e+01   -0.203   0.8394
hp:type1psychic           8.162e+00  9.589e+00    0.851   0.3951
hp:type1rock              1.651e+01  1.637e+01    1.008   0.3137
hp:type1steel             6.759e+01  6.240e+01    1.083   0.2792
```

hp:type1water	1.049e+01	1.041e+01	1.008	0.3140
speed:type1dark	3.927e+00	2.704e+01	0.145	0.8846
speed:type1dragon	-1.754e+01	6.020e+01	-0.291	0.7709
speed:type1electric	1.925e+01	3.190e+01	0.603	0.5465
speed:type1fairy	-3.791e+01	7.374e+01	-0.514	0.6074
speed:type1fighting	-4.120e+00	5.230e+01	-0.079	0.9372
speed:type1fire	3.370e-01	1.990e+01	0.017	0.9865
speed:type1flying	NA	NA	NA	NA
speed:type1ghost	5.692e+00	2.801e+01	0.203	0.8391
speed:type1grass	1.187e+01	1.213e+01	0.979	0.3281
speed:type1ground	-6.556e+00	1.946e+01	-0.337	0.7363
speed:type1ice	-9.553e+01	9.617e+01	-0.993	0.3210
speed:type1normal	8.873e+00	6.520e+00	1.361	0.1741
speed:type1poison	-2.654e+01	7.063e+01	-0.376	0.7072
speed:type1psychic	9.091e+00	6.482e+00	1.403	0.1613
speed:type1rock	1.679e+01	1.915e+01	0.877	0.3809
speed:type1steel	5.975e+01	1.098e+02	0.544	0.5866
speed:type1water	9.244e+00	7.260e+00	1.273	0.2035
attack:defense:hp	1.355e-04	9.331e-04	0.145	0.8846
attack:defense:speed	-1.771e-04	7.603e-04	-0.233	0.8159
attack:hp:speed	3.871e-04	1.330e-03	0.291	0.7712
defense:hp:speed	-4.618e-04	9.681e-04	-0.477	0.6335
attack:defense:type1dark	-2.695e-01	7.093e-01	-0.380	0.7041
attack:defense:type1dragon	4.102e-02	3.581e-01	0.115	0.9089
attack:defense:type1electric	-4.346e-01	4.307e-01	-1.009	0.3135
attack:defense:type1fairy	1.618e+00	2.104e+00	0.769	0.4425
attack:defense:type1fighting	-3.166e-01	5.200e-01	-0.609	0.5429
attack:defense:type1fire	7.735e-02	2.661e-01	0.291	0.7714
attack:defense:type1flying	NA	NA	NA	NA
attack:defense:type1ghost	-5.350e-02	3.084e-01	-0.173	0.8623
attack:defense:type1grass	-1.248e-01	1.161e-01	-1.075	0.2829
attack:defense:type1ground	1.171e-01	2.216e-01	0.529	0.5973
attack:defense:type1ice	1.088e+00	1.464e+00	0.743	0.4579
attack:defense:type1normal	-2.053e-01	9.573e-02	-2.144	0.0325 *
attack:defense:type1poison	3.623e-01	8.844e-01	0.410	0.6822
attack:defense:type1psychic	-2.659e-01	1.452e-01	-1.831	0.0676 .
attack:defense:type1rock	-6.816e-02	1.782e-01	-0.382	0.7023
attack:defense:type1steel	-2.689e-01	4.544e-01	-0.592	0.5543
attack:defense:type1water	-5.795e-02	9.202e-02	-0.630	0.5291
attack:hp:type1dark	-2.200e-01	4.030e-01	-0.546	0.5854
attack:hp:type1dragon	1.389e-01	3.958e-01	0.351	0.7257
attack:hp:type1electric	-4.306e-01	4.734e-01	-0.910	0.3634
attack:hp:type1fairy	2.185e+00	2.503e+00	0.873	0.3830

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attack:hp:type1fighting        -2.887e-02  3.772e-01   -0.077   0.9390
attack:hp:type1fire            -1.556e-01  3.461e-01   -0.449   0.6533
attack:hp:type1flying                  NA         NA       NA       NA
attack:hp:type1ghost            3.290e-02  5.689e-01    0.058   0.9539
attack:hp:type1grass           -1.208e-01  1.600e-01   -0.755   0.4507
attack:hp:type1ground           6.000e-02  1.896e-01    0.316   0.7518
attack:hp:type1ice              9.214e-01  1.038e+00    0.887   0.3753
attack:hp:type1normal          -1.541e-01  1.064e-01   -1.448   0.1481
attack:hp:type1poison           4.060e-01  1.000e+00    0.406   0.6851
attack:hp:type1psychic         -2.301e-01  1.689e-01   -1.362   0.1738
attack:hp:type1rock            -1.870e-01  2.443e-01   -0.766   0.4443
attack:hp:type1steel           -6.061e-01  7.106e-01   -0.853   0.3941
attack:hp:type1water           -1.350e-01  1.406e-01   -0.960   0.3375
defense:hp:type1dark           -2.607e-01  6.206e-01   -0.420   0.6746
defense:hp:type1dragon          3.674e-01  7.031e-01    0.523   0.6015
defense:hp:type1electric       -3.084e-01  5.343e-01   -0.577   0.5641
defense:hp:type1fairy           1.014e+00  1.293e+00    0.784   0.4332
defense:hp:type1fighting       -1.603e-01  7.523e-01   -0.213   0.8313
defense:hp:type1fire           -1.223e-01  3.318e-01   -0.369   0.7125
defense:hp:type1flying                 NA         NA       NA       NA
defense:hp:type1ghost           3.162e-02  4.283e-01    0.074   0.9412
defense:hp:type1grass          -9.847e-02  1.527e-01   -0.645   0.5192
defense:hp:type1ground          3.794e-02  1.932e-01    0.196   0.8444
defense:hp:type1ice             7.317e-01  1.315e+00    0.557   0.5780
defense:hp:type1normal         -1.944e-02  9.559e-02   -0.203   0.8389
defense:hp:type1poison          9.742e-02  1.120e+00    0.087   0.9307
defense:hp:type1psychic        -3.970e-02  1.150e-01   -0.345   0.7301
defense:hp:type1rock           -9.802e-02  1.456e-01   -0.673   0.5011
defense:hp:type1steel          -5.258e-01  5.793e-01   -0.908   0.3645
defense:hp:type1water          -4.007e-02  1.129e-01   -0.355   0.7227
attack:speed:type1dark         -8.913e-02  3.448e-01   -0.258   0.7962
attack:speed:type1dragon        1.356e-01  4.950e-01    0.274   0.7843
attack:speed:type1electric     -3.509e-01  4.638e-01   -0.757   0.4496
attack:speed:type1fairy         1.647e+00  1.712e+00    0.962   0.3363
attack:speed:type1fighting      3.522e-02  5.194e-01    0.068   0.9460
attack:speed:type1fire          7.468e-02  2.899e-01    0.258   0.7968
attack:speed:type1flying               NA         NA       NA       NA
attack:speed:type1ghost        -6.753e-02  4.037e-01   -0.167   0.8672
attack:speed:type1grass        -1.450e-01  1.647e-01   -0.881   0.3788
attack:speed:type1ground        1.492e-01  2.949e-01    0.506   0.6131
attack:speed:type1ice           1.551e+00  1.444e+00    1.075   0.2831
attack:speed:type1normal       -1.408e-01  1.051e-01   -1.339   0.1811
attack:speed:type1poison        5.549e-01  9.594e-01    0.578   0.5632
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attack:speed:type1psychic        -2.487e-01  1.416e-01  -1.756   0.0796 .
attack:speed:type1rock           -1.998e-01  2.900e-01  -0.689   0.4911
attack:speed:type1steel          -5.178e-01  1.164e+00  -0.445   0.6567
attack:speed:type1water          -1.010e-01  1.224e-01  -0.825   0.4098
defense:speed:type1dark          -1.712e-01  6.856e-01  -0.250   0.8030
defense:speed:type1dragon         2.312e-01  6.952e-01   0.332   0.7397
defense:speed:type1electric      -3.138e-01  5.430e-01  -0.578   0.5636
defense:speed:type1fairy          2.553e-01  8.495e-01   0.301   0.7639
defense:speed:type1fighting      -7.454e-02  1.070e+00  -0.070   0.9445
defense:speed:type1fire           6.893e-02  3.125e-01   0.221   0.8255
defense:speed:type1flying               NA         NA      NA       NA
defense:speed:type1ghost         -2.244e-01  3.292e-01  -0.682   0.4958
defense:speed:type1grass         -2.814e-01  1.736e-01  -1.621   0.1056
defense:speed:type1ground         5.633e-02  2.836e-01   0.199   0.8426
defense:speed:type1ice            1.099e+00  1.604e+00   0.685   0.4935
defense:speed:type1normal        -1.019e-01  1.094e-01  -0.931   0.3521
defense:speed:type1poison         1.562e-01  1.043e+00   0.150   0.8810
defense:speed:type1psychic       -1.360e-01  8.562e-02  -1.588   0.1128
defense:speed:type1rock          -1.744e-01  1.630e-01  -1.070   0.2853
defense:speed:type1steel         -6.097e-01  1.043e+00  -0.585   0.5590
defense:speed:type1water         -8.716e-02  8.977e-02  -0.971   0.3320
hp:speed:type1dark               -9.999e-02  4.823e-01  -0.207   0.8358
hp:speed:type1dragon              3.402e-01  9.115e-01   0.373   0.7091
hp:speed:type1electric           -2.654e-01  5.252e-01  -0.505   0.6135
hp:speed:type1fairy               1.077e+00  1.586e+00   0.679   0.4972
hp:speed:type1fighting            4.001e-01  9.486e-01   0.422   0.6734
hp:speed:type1fire               -2.037e-01  3.939e-01  -0.517   0.6052
hp:speed:type1flying                    NA         NA      NA       NA
hp:speed:type1ghost               1.884e-02  5.606e-01   0.034   0.9732
hp:speed:type1grass              -1.882e-01  2.287e-01  -0.823   0.4110
hp:speed:type1ground             -2.587e-02  2.017e-01  -0.128   0.8980
hp:speed:type1ice                 1.086e+00  1.264e+00   0.859   0.3908
hp:speed:type1normal             -8.834e-02  1.058e-01  -0.835   0.4043
hp:speed:type1poison              2.321e-01  1.275e+00   0.182   0.8556
hp:speed:type1psychic            -3.975e-02  1.175e-01  -0.338   0.7353
hp:speed:type1rock               -1.944e-01  2.374e-01  -0.819   0.4132
hp:speed:type1steel              -1.066e+00  1.676e+00  -0.636   0.5252
hp:speed:type1water              -1.190e-01  1.357e-01  -0.877   0.3809
attack:defense:hp:speed          -1.308e-06  1.191e-05  -0.110   0.9126
attack:defense:hp:type1dark       4.955e-03  8.269e-03   0.599   0.5493
attack:defense:hp:type1dragon    -2.248e-03  4.263e-03  -0.527   0.5982
attack:defense:hp:type1electric   6.013e-03  6.809e-03   0.883   0.3776
attack:defense:hp:type1fairy     -2.850e-02  3.387e-02  -0.841   0.4005
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attack:defense:hp:type1fighting      1.488e-03   6.950e-03    0.214    0.8305
attack:defense:hp:type1fire          7.338e-04   4.350e-03    0.169    0.8661
attack:defense:hp:type1flying              NA          NA       NA        NA
attack:defense:hp:type1ghost        -3.918e-04   5.767e-03   -0.068    0.9459
attack:defense:hp:type1grass         1.660e-03   1.891e-03    0.878    0.3804
attack:defense:hp:type1ground       -1.144e-03   2.225e-03   -0.514    0.6074
attack:defense:hp:type1ice          -1.189e-02   1.743e-02   -0.682    0.4955
attack:defense:hp:type1normal        1.576e-03   1.215e-03    1.297    0.1951
attack:defense:hp:type1poison       -4.006e-03   1.452e-02   -0.276    0.7827
attack:defense:hp:type1psychic       2.151e-03   2.129e-03    1.011    0.3126
attack:defense:hp:type1rock          7.533e-04   2.301e-03    0.327    0.7435
attack:defense:hp:type1steel         4.437e-03   6.361e-03    0.698    0.4857
attack:defense:hp:type1water         8.709e-04   1.530e-03    0.569    0.5695
attack:defense:speed:type1dark       2.915e-03   8.479e-03    0.344    0.7311
attack:defense:speed:type1dragon    -1.370e-03   5.605e-03   -0.245    0.8069
attack:defense:speed:type1electric   5.817e-03   7.415e-03    0.784    0.4331
attack:defense:speed:type1fairy     -1.655e-02   2.168e-02   -0.764    0.4455
attack:defense:speed:type1fighting   9.482e-04   9.676e-03    0.098    0.9220
attack:defense:speed:type1fire      -1.442e-03   3.734e-03   -0.386    0.6996
attack:defense:speed:type1flying           NA          NA       NA        NA
attack:defense:speed:type1ghost      2.193e-03   3.966e-03    0.553    0.5806
attack:defense:speed:type1grass      3.264e-03   2.057e-03    1.587    0.1131
attack:defense:speed:type1ground    -2.111e-03   4.426e-03   -0.477    0.6335
attack:defense:speed:type1ice       -1.870e-02   2.278e-02   -0.821    0.4120
attack:defense:speed:type1normal     1.994e-03   1.230e-03    1.621    0.1057
attack:defense:speed:type1poison    -5.052e-03   1.392e-02   -0.363    0.7169
attack:defense:speed:type1psychic    3.134e-03   1.685e-03    1.860    0.0635  .
attack:defense:speed:type1rock       1.485e-03   2.620e-03    0.567    0.5710
attack:defense:speed:type1steel      5.081e-03   1.098e-02    0.463    0.6437
attack:defense:speed:type1water      1.031e-03   1.283e-03    0.804    0.4218
attack:hp:speed:type1dark            2.182e-03   5.276e-03    0.414    0.6794
attack:hp:speed:type1dragon         -3.091e-03   6.406e-03   -0.482    0.6297
attack:hp:speed:type1electric        4.748e-03   7.296e-03    0.651    0.5155
attack:hp:speed:type1fairy          -3.327e-02   3.296e-02   -1.009    0.3133
attack:hp:speed:type1fighting       -4.095e-03   8.918e-03   -0.459    0.6463
attack:hp:speed:type1fire            1.221e-03   5.071e-03    0.241    0.8098
attack:hp:speed:type1flying                NA          NA       NA        NA
attack:hp:speed:type1ghost          -7.110e-04   7.661e-03   -0.093    0.9261
attack:hp:speed:type1grass           2.029e-03   2.841e-03    0.714    0.4755
attack:hp:speed:type1ground         -1.310e-03   2.818e-03   -0.465    0.6421
attack:hp:speed:type1ice            -1.748e-02   1.830e-02   -0.955    0.3400
attack:hp:speed:type1normal          1.003e-03   1.530e-03    0.656    0.5123
attack:hp:speed:type1poison         -6.430e-03   1.607e-02   -0.400    0.6892
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attack:hp:speed:type1psychic               1.625e-03   2.012e-03    0.808   0.4195
attack:hp:speed:type1rock                   2.179e-03   3.685e-03    0.591   0.5546
attack:hp:speed:type1steel                  9.289e-03   1.761e-02    0.528   0.5980
attack:hp:speed:type1water                  1.223e-03   1.979e-03    0.618   0.5366
defense:hp:speed:type1dark                  2.897e-03   7.303e-03    0.397   0.6917
defense:hp:speed:type1dragon               -4.622e-03   1.108e-02   -0.417   0.6769
defense:hp:speed:type1electric              4.266e-03   8.856e-03    0.482   0.6302
defense:hp:speed:type1fairy                -1.098e-02   1.754e-02   -0.626   0.5316
defense:hp:speed:type1fighting             -3.619e-03   1.734e-02   -0.209   0.8348
defense:hp:speed:type1fire                  1.272e-03   5.283e-03    0.241   0.8098
defense:hp:speed:type1flying                       NA          NA       NA       NA
defense:hp:speed:type1ghost                 1.966e-03   6.104e-03    0.322   0.7476
defense:hp:speed:type1grass                 4.073e-03   3.158e-03    1.290   0.1978
defense:hp:speed:type1ground                5.609e-04   2.617e-03    0.214   0.8304
defense:hp:speed:type1ice                  -1.275e-02   2.090e-02   -0.610   0.5421
defense:hp:speed:type1normal                8.393e-04   1.471e-03    0.571   0.5685
defense:hp:speed:type1poison               -4.366e-04   1.911e-02   -0.023   0.9818
defense:hp:speed:type1psychic               7.607e-04   1.498e-03    0.508   0.6118
defense:hp:speed:type1rock                  1.837e-03   2.173e-03    0.845   0.3983
defense:hp:speed:type1steel                 9.645e-03   1.501e-02    0.643   0.5206
defense:hp:speed:type1water                 9.741e-04   1.628e-03    0.598   0.5498
attack:defense:hp:speed:type1dark          -5.215e-05   9.101e-05   -0.573   0.5669
attack:defense:hp:speed:type1dragon         3.521e-05   7.086e-05    0.497   0.6195
attack:defense:hp:speed:type1electric      -7.879e-05   1.154e-04   -0.683   0.4949
attack:defense:hp:speed:type1fairy          3.693e-04   3.994e-04    0.925   0.3556
attack:defense:hp:speed:type1fighting       3.545e-05   1.534e-04    0.231   0.8174
attack:defense:hp:speed:type1fire          -6.094e-06   6.214e-05   -0.098   0.9219
attack:defense:hp:speed:type1flying                NA          NA       NA       NA
attack:defense:hp:speed:type1ghost         -1.067e-05   7.268e-05   -0.147   0.8834
attack:defense:hp:speed:type1grass         -4.496e-05   3.563e-05   -1.262   0.2075
attack:defense:hp:speed:type1ground         1.767e-05   3.866e-05    0.457   0.6479
attack:defense:hp:speed:type1ice            2.120e-04   2.851e-04    0.744   0.4575
attack:defense:hp:speed:type1normal        -1.449e-05   1.608e-05   -0.901   0.3679
attack:defense:hp:speed:type1poison         5.395e-05   2.372e-04    0.227   0.8201
attack:defense:hp:speed:type1psychic       -2.115e-05   2.405e-05   -0.879   0.3797
attack:defense:hp:speed:type1rock          -1.407e-05   3.327e-05   -0.423   0.6725
attack:defense:hp:speed:type1steel         -8.047e-05   1.572e-04   -0.512   0.6089
attack:defense:hp:speed:type1water         -1.193e-05   2.079e-05   -0.574   0.5664
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


Residual standard error: 53.29 on 525 degrees of freedom
  (1 observation deleted due to missingness)
```

```
Multiple R-squared:  0.6792,    Adjusted R-squared:  0.5117
F-statistic: 4.056 on 274 and 525 DF,  p-value: < 2.2e-16
```

Adjusted R-squared: 0.5117

Nested F-test

```
   anova(add_capture_model3, interact_capture_model3)
```

```
Analysis of Variance Table

Model 1: capture_rate ~ attack + defense + hp + speed + type1
Model 2: capture_rate ~ attack * defense * hp * speed * type1
  Res.Df     RSS  Df Sum of Sq      F  Pr(>F)
1    778 2379856
2    525 1490729 253    889128 1.2377 0.02251 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

p-value is less than 0.05 so maybe going with the interaction model will help and the adjusted r-squared has enough of an increase to consider it.

Opinion: Definitely a bit messy with my visualizations but again will have a hard time analyzing all the variables in the equation and the model.